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1. Introduction

This specification describes a 17.0" color TFT LCD monitor which is supported by analog interface solution and support maximum resolution 1280x1024 at 76 Hz refresh rate. It has the following features:

- User controls:
(a) "Power on/off" switch.
(b) "Exit" key(Back to main menus or leave OSD menu and hot key of Volume adjustment).
(c) "I-key"(For auto adjust vertical position, phase, horizontal position and pixel clock).
(d) "Enter" key(For enter sub-menus or select items.).
(e) "Left" key (Select left, decreasing adjust and hot key of Contrast adjustment).
(f) "Right" key (Select right, increasing adjust and hot key of Brightness adjustment).
- OSD window for control and information display with 8 languages selection.
- DPMS (Display Power Management System)
- Power on/off indicator.
- Audio speakers supported. (option)
- High quality advanced zoom function (Scaling function)
- Tilt base : Attached base with 0~25 degree tilt.
-DDC2B function supported.

- A LCD monitor
(a)Head part:
(1) A LCD module(AU 170ES05).
(2) An AC power and inverter board.
(3) An Interface board.
(4) A control board.
(5) A signal cable with 15pin D-sub connector .
(6) Two speakers.

(b) Base part:

(1)Tilt base. (2)Foldable
- A power cord
- An user menu.
-Setup disk. (including .INF/.ICM/Test pattern) --all INF/ICM/Test pattern are loaded in CD manual + Quick start guide
- An audio cable.

2. Operational Specification

2.1 Environment

2.1.1 Temperature

-Operating	0 to 40 °C
-Storage	-20 to 60 °C

2.1.2 Relative Humidity

-Operating	10 to 90% Max. (non-condensing)
-Storage	10 to 95% Max. (non-condensing)

2.1.3 Altitude

-Operating	0 to 3,048m (10,000ft)
-Storage	0 to 12,192m (40,000ft)

2.2 Transportation

2.2.1 Vibration Test (Package, Non-Operating)

A) Sine-wave vibration for initial resonance sweeps and dwell

* Sine sweep

Frequency (Hz)	Status
5 ~ 26.6	0.6G
26.6 ~ 50	0.016"
50 ~ 500	1.5G

Sweep times: 1 sweep / Per Axis (X,Y, and Z Axis)

* One major resonance dwell is required for each axis.

Total dwell time at each resonance point shall be 15 minutes.

B) Random Vibration

Frequency (Hz)	Slope (dB/Oct.)	Spectrum Level (g2/Hz)
5 ~ 100	0	0.015
100 ~ 200	-6	---
200	---	0.0038

Equivalent to 1.47 G rms

* Duration: 30 Minutes / Per Axis (X,Y, and Z Axis)

Total test time : 90 Minutes

2.2.2 Drop Test (Package, Non-Operating)

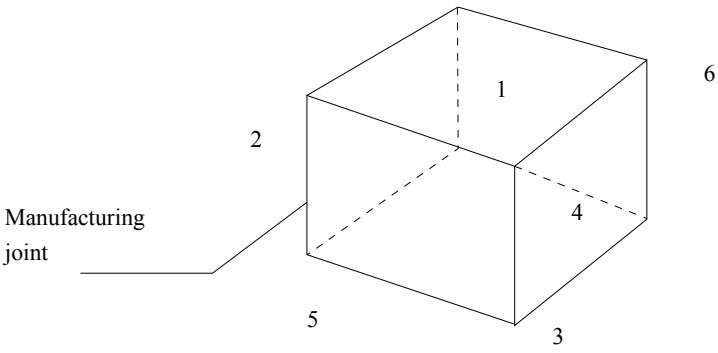
A) Drop Height

Weight (Kg)	**ACM Spec. Height (cm)**
0 – 9	91
> 9 - 18.2	76
> 18.2 - 27.2	61
> 27.2 - 45.4	46
> 45.4 - 68.1	31
> 68.1 – 113.5	26

Upgrade one level of height before MP.

B) Drop Sequence

Surface
1. Top
2. Front
3. Bottom
4. Rear
5. Right
6. Left



-Corner 5-3-2 select at weakness side [the low left(or right) corner of the front panel]

-An edge drop with impact on the shortest edge radiating from corner 5-3-2

-An edge drop with impact on the next shortest edge radiating from corner 5-3-2

-An edge drop with impact on the longest edge radiating from corner 5-3-2

-A flat drop with impact on the rear

-A flat drop with impact on the front

-A flat drop with impact on the right

-A flat drop with impact on the left

-A flat drop with impact on the bottom

-A flat drop with impact on the top

After test, there is no electrical and mechanical damage permitted.

2.2.3 Vibration Test (Unpackaged, Non-Operating)

5~200Hz at 1.04g rms

FREQUENCY (Hz)	SPECTRUM LEVEL (g^2/Hz)
2.0	0.0185
4.0	0.0300
8.0	0.0300
40.0	0.0030
55.0	0.0100
70.0	0.0100
200.0	0.0010

- DURATION: 15 MINUTES PER AXIS.

2.2.4 HALF-SINE SHOCK

Test conditions:
Test unit : 2 sets
Each unit has to withstand 18 shocks.(3 shocks pre face)
No- operation
Half-sine wave
Duration : 3ms
Acceleration(G) : 75G

2.3 Packing Configuration

2.3.1 Container Specification

a. Shipping Container

Container Type		20'*8'*8'6" Steel	40'*8'*8'6" Steel	40'*8'*9'6" High Cube Steel
Weight (Kegs)	Gross	24,000	30,480	30,480
	Tare	2,370	4,000	4,200
	Payload	21,630	26,480	26,280
Interior Measurement (mm)	Length	5,898	12,031	12,031
	Width	2,352	2,352	2,352
	Height	2,394	2,394	2,699
Volume (Cubic Meter)		33.2	67.74	76.4
Door opening (mm)	Width	2,340	2,340	2,340
	Height	2,280	2,280	2,585
Useable Interior Dimension (Deducted pallet (130mm & Operating space 50mm)	Length	5,890	12,000	12,000
	Width	2,330	2,330	2,330
	Height	2,100	2,100	2,405

b. Air Transport

Container Type		Container (1) 125"*96"*96"	Container (2) 125"*96"*118"	Container (3) 125"*88"*64"
Weight (Kegs)	Gross	6,804	6,804	4,627
	Tare	129	129	129
	Payload	6,675	6,675	4,498
Interior Measurement (mm)	Length	3,048	3,048	3,048
	Width	2,260	2,260	2,082
	Height	2,438	2,997	1,625
Volume (Cubic Meter)		17	19	11

2.3.2 Carton Specification

Product Weight (Kegs)	Net	4.2
	Gross	6.2
Carton Interior Measurement (mm)	Length	406
	Width	418
	Height	139
Carton External Measurement (mm)	Length	423
	Width	456
	Height	146

2.3.3 Pallet Specification

a. Dimension

Transport Type		Pallet A	Pallet B	Pallet C	Pallet D
Shipping Pallet Dimension (mm)	Length	812	812	406	406
	Width	836	1254	836	1254
	Height	115	115	115	115
Air Transport Pallet Dimension (mm)	Length	X	X	X	X
	Width	X	X	X	X
	Height	X	X	X	X

2.3.4 Container Carrying Capacity

a. Shipping Container

Stowing Type		Quantity of products (sets) (Every container)	Quantity of Products (sets) (Every Pallet)	Quantity of pallet (sets) (Every Container)
with pallet	20'	910	Pallet A: 56	Pallet A: 6
			Pallet B: 84	Pallet B: 6
			Pallet C: 28	Pallet C: 1
			Pallet D: 42	Pallet D: 1
	40'	1960	Pallet A: 56	Pallet A: 14
			Pallet B: 84	Pallet B: 14

2.4 Electrostatic Discharge Requirements

The subject product must withstand 8 KV for contact discharge and 15 KV for air discharge of Electrostatic Discharge and meet the acceptance criteria as specified IEC 801-2 .

2.5 Safety Requirements

The display unit complies with the following safety standards and specifications.
-UL compliance....standard for information-processing and business equipment, UL 1950.
-CSA compliance...standard C22.2 No. 950-M89, data processing equipment.
-TUV compliance...EN60950 safety specification-business equipment.
-ISO13406-2 .Ergonomic Requirements of Visual Display.
-Demko...EN60950.
-Nemko...EN60950.
-Semko...EN60950.
-Fimko...EN60950.

2.6 EMI Requirements

1. This display unit complies with the following EMC rules and regulations.
   -FCC compliance...FCC Rule, Part 15, Subpart B, Class B.
   -VCCI compliance...VCCI Rule, Class-2.
   -CE Mark Compliance... 89/336/EEC.
   EN55024, EN61000-4-2/-3/-4/-5/-6/-8/-11
   EN55022, Class B.
   EN61000-3-2,EN61000-3-3.

-DNSF compliance...EN55022, Class B.
-MPR2 compliance
- TCO99
-C-Tick
-BSMI
-EPA

2. The sample for EMI agency approval should be under 4 dB of the limit.
The production pilot run units should be under 3 dB of the limit.
The mass production units should be under 1 dB of the limit.

2.7 Reliability

1. The prediction MTBF of display unit shall be greater than 60,000 hours excluding the lamp.(at 25 ℃)
2. Lamp life time : 40,000 hrs typical at which brightness of lamp is 50% compare to that of initial value at 7.0mA and 25℃.

2.8 Mechanical Design for TCO 03:

1) Front Frame Reflectance:

* diffuse reflectance: ≦ ±10%

* Gloss≦ ± 2% gloss unit

2) Labeling of plastics:

Plastic weight > 25g shall be marked in accordance with ISO11469

3) Variety of Plastic:

Type of plastic material is synonymous with the term basic polymer used in ISO1043-1. For blends of plastics e.g. PC+ABS, all weight ratios are considered to be the same type of material.

4) Painting of Plastic:
Plastic materials weighing more than 25 grams included in the VDU. Different kinds of adapters are defined as parts of VDU. Printed wiring board laminates and the flat panel itself are excluded.

5) Metallization of Plastic Housing:

* Metallized name-plates and control knobs are accepted.

6) Plastic components > 25g shall not contain retardants of organically bound chloride or bromide.

2.9 Environment Protection Design:

Product is Per ES 715-c49 Environment Design Guide

2.10 Acoustical Noise

With the display operating, the issue of sound measured is contained within 40 dB/A in the audible field.

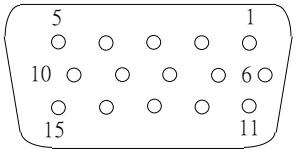
3. Input / Output Signal Specification

3.1 Input Signal Requirements

3.1.1 Signal cable (Directly attached to unit)

3.1.1.1 Video Inputs:

(1) DSUB –digital Signal Inputs
15pin D-sub connector is on the captive signal cable for IBM VGA, compatible graphic adapters.
The pin assignment of this connector is described as below:



15pin D-sub female

1	RED VIDEO
2	GREEN VIDEO
3	BLUE VIDEO
4	GROUND
5	Cable Detect
6	RED GROUND
7	GREEN GROUND
8	BLUE GROUND
9	PC5V
10	SYNC GROUND
11	GROUND
12	SDA
13	H SYNC (H+V)
14	V SYNC
15	SCL

3.1.1.2 Cable length:

1600mm +/- 20mm

3.1.2 Video signals:

RGB separate, Analog 0.7Vp-p/75 Ohm

3.1.3 Sync signal:

- H/V separate, TTL level
- H/V composite, TTL level

3.2 Function

3.2.1 Support timing

This Interface board is designed to operate in any of the following video mode.

Incoming display mode (Input timing)					Multi-scan operation
Resolution	**Horizontal Frequency (KHz)**	**Vertical Frequency (Hz)**	**Dot Clock Frequency (MHz)**	**Remark**	**Actual display resolution**
640x350	31.47(P)	70.08(N)	25.17	DOS	1280x943
720x400	31.47(N)	70.08(P)	28.32	DOS	full screen 1280x1024
640x480	31.47(N)	60.00(N)	25.18	DOS	
640x480	35.00(N)	67.00(N)	30.24	Macintosh	
640x480	37.86(N)	72.80(N)	31.5	VESA	
640x480	37.50(N)	75.00(N)	31.5	VESA	
800x600	37.88(P)	60.32(P)	40.00	VESA	
800x600	48.08(P)	72.19(P)	50.00	VESA	
800x600	46.86(P)	75.00(P)	49.50	VESA	
832X624	49.72(N)	74.55(N)	57.29	Macintosh	
1024x768	48.36(N)	60.00(N)	65.00	VESA	
1024x768	56.48(N)	70.10(N)	75.00	VESA	
1024x768	60.02(P)	75.00(P)	78.75	VESA	
1024X768	60.24(N)	74.93(N)	80.00	Macintosh	
1152x864	67.50(P)	75.00(P)	108.00	VESA	
1152x870	68.68(N)	75.06(N)	100.00	Macintosh	
1152x900	61.80(N)	66.00(N)	94.50	SUN 66	
1152x900	71.81(N)	76.14(N)	108.00	SUN	
1280x1024	64.00(P)	60.00(P)	108.00	VESA	
1280x1024	75.83(N)	71.53(N)	128.00	IBM1	
1280x1024	80.00(P)	75.00(P)	135.00	VESA	
1280x1024	81.18(N)	76.16(N)	135.09	SPARC2	

Notes：

(1) If the incoming display mode is not supported by this I/F board listed above, the picture can show up or doesn't which is unpredictable, even the picture can display but probably isn't good or clear.

(2) Some signals from graphics board may not function properly.

(3) "P", "N" stands for "Positive", "Negative" polarity of incoming HSYNC/VSYNC(input timing).

(4) OSD will show "No Signal" message on the screen as below to indicate it while no display mode inputs.

(5) OSD will show "No Cable Connection" message on the screen as below to indicate it while no cable plug in PC.

(6) OSD will show "Out of Range" message on the screen to indicate it while input display mode meet the following condition

(a) The resolution is large than 1280x1024.

(b) The resolution is 1280x1024 but it frequency of vertical sync (Fv) is large than 77Hz.

(c) The frequency of horizontal sync (Fh) is large than 83KHz.

(d) The frequency of vertical sync (Fv) is large than 76Hz.

3.3 Number of display colors:

16M color numbers (With Dithering)

3.4 Adjustment function

Brightness
Contrast
Display position (Vertical , Horizontal)
Phase
Pixel clock
Color gain(Red, Green, Blue)
OSD position (Vertical , Horizontal)
Multi-language selection
OSD time
Volume
Recall function(Color Recall、Recall All)

3.5 Power Supply Requirements

3.5.1 Input Power Requirements

(1) Input Voltage Range

The unit shall meet all the operating requirements with an input voltage range of 90~264 Vac .

(2) Input Current

Maximum Input Current	Measuring Range
(MAX) 2 Arms	90Vac ～ 264Vac

(3) Frequency Range

The unit shall operate within a frequency range of 47Hz to 63Hz.

(4) Inrush Current

Power supply inrush current shall be less than the ratings of its critical components(including Power switch, fuse, rectifiers and surge limiting device) for all conditions of line voltage.

(5) Regulator Efficiency

70% minimum (measuring at 115Vac and full load)
Power saving mode ＜ 1 Watts at 115vac

3.5.2 Output Power Requirement

The power circuit shall supply DC power outputs as followings:

Output	Nominal	Regulation	Load Current Range
1	5V-panel	±10%	0 ~ 1.0A
2	3.3V-Fix	±5%	0 ~ 1.0A

3.5.3 Power Management

Mode	H/Vsync	Power consumption	LED Color (Status)	Recovery Time
Normal	Both exist	< 50W (with audio)	Blue (Normal)	--
Normal	Both exist	< 40W (without audio)	Blue (Normal)	--
off	None or Only one exist	< 1W, under 115Vac < 2W, under 264Vac	Amber	< 3 sec

3.6 Specification of Inverter

The backlight system is an edge-lighting type with 4 CCFLs (Cold Cathode Fluorescent Tube). The characters of dual lamps are shown in the following tables.

ITEM	SYMBOL	MIN	TYP	MAX	Unit	Condition
Lamp Voltage	**VL**	**--**	**700**	**860**	**V**	**IL=7.0 mA**
Lamp Current	**IL**	**13**	**14**	**15**	**mA**	**Each connector**
Inverter Frequency	**FL**	**40**	**50**	**80**	**kHz**	
Starting lamp voltage	**VS**	**1700**	**--**	**--**	**V**	**Tb=0 °C**
		1200	**--**	**--**	**V**	**Ta=25°C**
Lamp life time	**LT**	**30,000**	**40,000**	**--**	**Hr**	**I_L = 7.0±0.5mA Continuous Operation Ta=25±5 °C**

NOTE: 1.All condition are at 25C ambient unless otherwise specified.
2. Load Panel=SXGA 17”

3.7 Panel optical Characteristics

Item	Unit	Conditions	Min.	Typ.	Max.
Viewing Angle	[degree]	Horizontal (Right) CR = 10 (Left)	60 60	70 70	-
		Vertical (Up) CR = 10 (Down)	60 60	70 70	-
		Horizontal (Right) CR = 5 (Left)	70 70	80 80	- -
		Vertical (Up) CR = 5 (Down)	70 70	80 80	- -
Contrast ratio		Normal Direction	250	450	-
Response Time (Note 1)	[msec]	Raising Time	-	4	5
		Falling Time	-	12	20
		Raising + Falling	-	16	25
Color / Chromaticity Coordinates (CIE)		Red x	0.61	0.64	0.67
		Red y	0.31	0.34	0.37
		Green x	0.26	0.29	0.32
		Green y	0.58	0.61	0.64
		Blue x	0.11	0.14	0.17
		Blue y	0.04	0.07	0.10
Color Coordinates (CIE) White		White x	0.28	0.31	0.34
		White y	0.30	0.33	0.36
White Luminance @ CCFL 7.0mA (center)	[cd/m^2]		200	260	-
Luminance Uniformity (Note 2)	[%]		75	80	-
Crosstalk (in 75Hz) (Note 3)	[%]				1.5

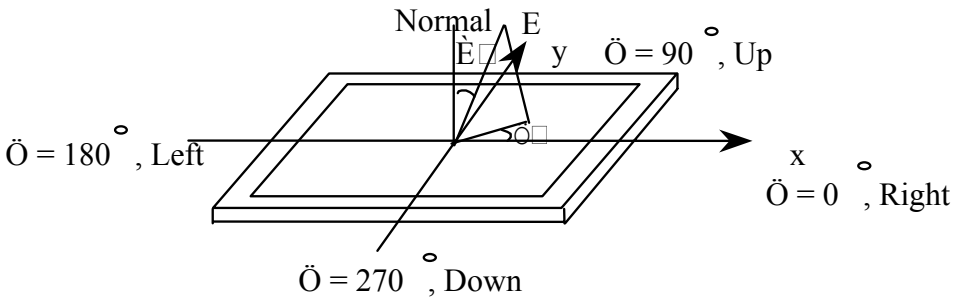
Note：

1. Viewing Angle, Contrast Ratio, Response Time, Reflectance, and Chromaticity are measured at panel center.
2. Viewing Angle（θ, ϕ）

   Measurement is done on position 1.

   Viewing angle origine is the axis normal to the flat panel. Left (L) and Right (R) value are the maximum angles for which CR=10. Up (U) and (D) value are the maximum angles for which CR=10.

   See figure below



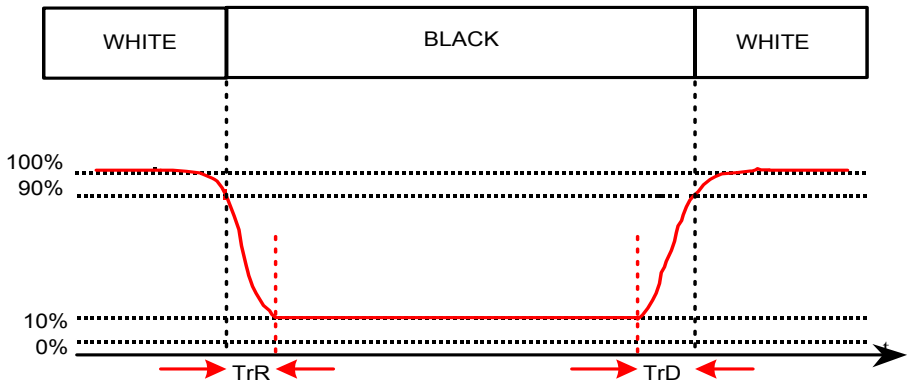
3.Contrast Ratio (CR) is defined mathematically as:

$$\frac{\text{Luminance in White Level (Max.)}}{\text{Luminance in Black Level (Min.)}}$$

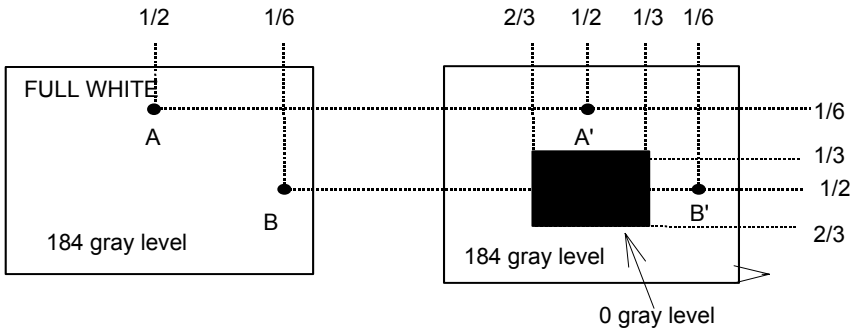
(at $\theta = 0^o, \varphi = 0^o$)

4. Response time

TrR measures the transition time of L1 relative luminance from white to black state, from 90% to 10% (see graph below)
TrD measures the transition time of L1 relative luminance from black to white state, from 10% to 90% (see graph below)



5. Cross talk shall be measured between two patterns.

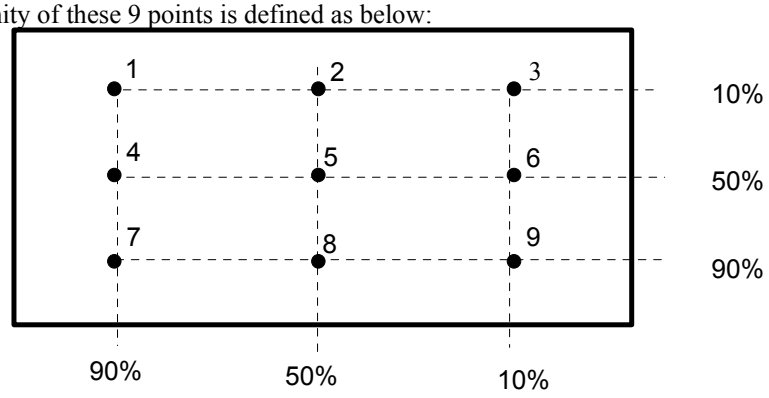


$|L_A - L_{A'}| / L_A \times 100\% = 1.2\%$ max., L_A and L_B are brightness at location A and B
$|L_B - L_{B'}| / L_B \times 100\% = 1.2\%$ max., $L_{A'}$ and $L_{B'}$ are brightness at location A' and B'

LA：Luminance of measured point in A (cd/m2)
LB：Luminance of measured point in B (cd/m2)
LA'：Luminance of measured point in A' (cd/m2)
LB'：Luminance of measured point in B' (cd/m2)

(at Viewing Angle $\theta = 0^\circ, \varphi = 0^\circ$)

6. Brightness Uniformity of these 9 points is defined as below:



Brightness Uniformity = Min. brightness / Max. brightness x 100 % > 70%

4. Functional specification

All the tests to verify specifications in this section must be performed under the following standard conditions unless otherwise noted. The standard conditions are:

-Temperature : 0 to 40 degree Celsius
-AC line input voltage : 90 Vac to 264 Vac, 47Hz or 63Hz
-Warm-up time : 30 minutes minimum

4.1 Display Quality

4.1.1 Display Data Area (with full white pattern)

(1) Horizontal: 337.920 mm
(2) Vertical: 270.336 mm

4.1.2 Video Performance

(1) Resolution : 1280 X 1024 pixels Maximum
(2) Contrast ratio : 250(Min.), 450(Typ.)
(3) Response time : 16 mS(Typ.)
(4)Viewing angle : Up:70° Down:70° R/L:70° (At contrast ratio >= 10)
(5)CIE Coordinate: White (0.31, 0.33) +/- (0.03, 0.03) (at user mode)
(6) Display color: 18 bits color

4.1.3 Light Output

Brightness rating : 260cd/㎡(Typ.) @7.0mA

4.1.4 Brightness Adjustment Range

At contrast ratio control set at maximum level, adjusting Brightness control from minimum to maximum position, the light output of WHITE pattern shall be increased more than 40cd/㎡.

4.2 Audio Quality

4.2.1 Preamp + Poweramp:

(1) Output Power : 1.0 W rms/CH @ 1KHz,1Vp-p
(2) THD (@ 1W) : <10%
(3) S/N ratio : 50db

4.2.2 Speaker Driver:

(1) Nominal Impedance: 8 Ohm
(2) Maximum Input Power: 2 W/CH
(3) Frequency Response: 12KHz
(4) Size: 40*28.5 mm
(5) Magnetic Shield: Required

4.2.3 Audio Controls:

(1) Volume 0- 100 levels

5. Physical Specifications

5.1 Physical Dimension & Appearance

5.1.1 Overall Dimensions:

375mm (W) X 370mm (H) X 155mm (D)

5.1.2 Outer Appearance:

see Fig.1

5.2 Construction and Materials on outer surface

(1) Materials: Plastic

(2) Color: To be defined for Model

5.3 Base

(1)Tilt: fiest hinge:0°~ 25°

5.4 Marking & Labels

5.4.1 Reference Label (Rear panel)

(1) Reference numbers

(2) Manufacture data

(3) Agency Approvals

(4) Power Ratings

5.4.2 Controls & Connectors

(1) AC power cord input: abbreviated labels

(2) User's Controls: standard print

5.5 Packaging

5.5.1 Carton Dimension:

456mm (W) X423mm (D) X 146mm (H) (LCD monitor)

5.5.2 Shipping Weight:

5.8kg (LCD monitor)

5.5.3 Shipping Container:

1960 sets per 40 feet container with pallet.

6. Maintainability Specifications

6.1 General & Requirements

6.1.1 Installation:

From outside of unit with standard tools and documentation provided to user.

6.1.2 Periodic Maintenance:

No periodic maintenance is required.

6.1.3 Repair & Calibration:

Require spare modules or components as specified as followings:

(1) Interface board ASSY

(2) AC-DC converter board ASSY

(3) Control board ASSY

6.2 Mean Time to Repair

6.2.1 Module Level:

Less than 10 minutes

6.2.2 Component Level:

Less than 15 minutes

6.3 Accessibility

6.3.1 General:

All panels, covers, and major assemblies are removable without disruption of permanent mounting or fasteners.

6.3.2 Outside Cabinet, access to the following elements

-Operating Controls
-AC Inlet
-Audio in

6.3.3 Cover Removal, Access

All sub assemblies and internally adjustable components may be accessed by removing the base and the rear cover .

6.4 Equipment & Tools Required

6.4.1 Standard Test Equipment

(1) Voltmeter
(2) Dual trace oscilloscope
(3) Hand tools as required
(4) Computer with IBM VGA , or compatible graphic adapter

6.4.2 Documentation

A service manual will be available which covers all service requirements. A users manual written in Japanese German, Italian, Spanish, France and English will be available to ship with the product.

6.5 Electrical Emission and Energy Saving summary for TCO03

6.5.1 Electrical Field(AC):

*Band I< 10V/m (132cd/m^2,"+" pattern)
*Band II< 1V/m (132cd/m^2,"+" pattern)
Note: Shielded power cord is not acceptable

6.5.2 Magnetic Field(AC):

*Band I< 200nt (132cd/m^2,"+" pattern)
*Band II< 32nt (132cd/m^2,"+" pattern)
Note: Shielded power cord is not acceptable

6.5.3 Energy Saving:

*1st stage:<15W(recover time:3 sec)
2nd stage:<5W
*single stage:<5W(recover time: 3sec)

Appendix 1 – Shipment Conditions

ITEM	State
Power	ON
Brightness	90
Contrast	50
OSD- Timeout	10s
OSD-Language	English
OSD-Image size	Full Screen
OSD-Color temp	CU MODE

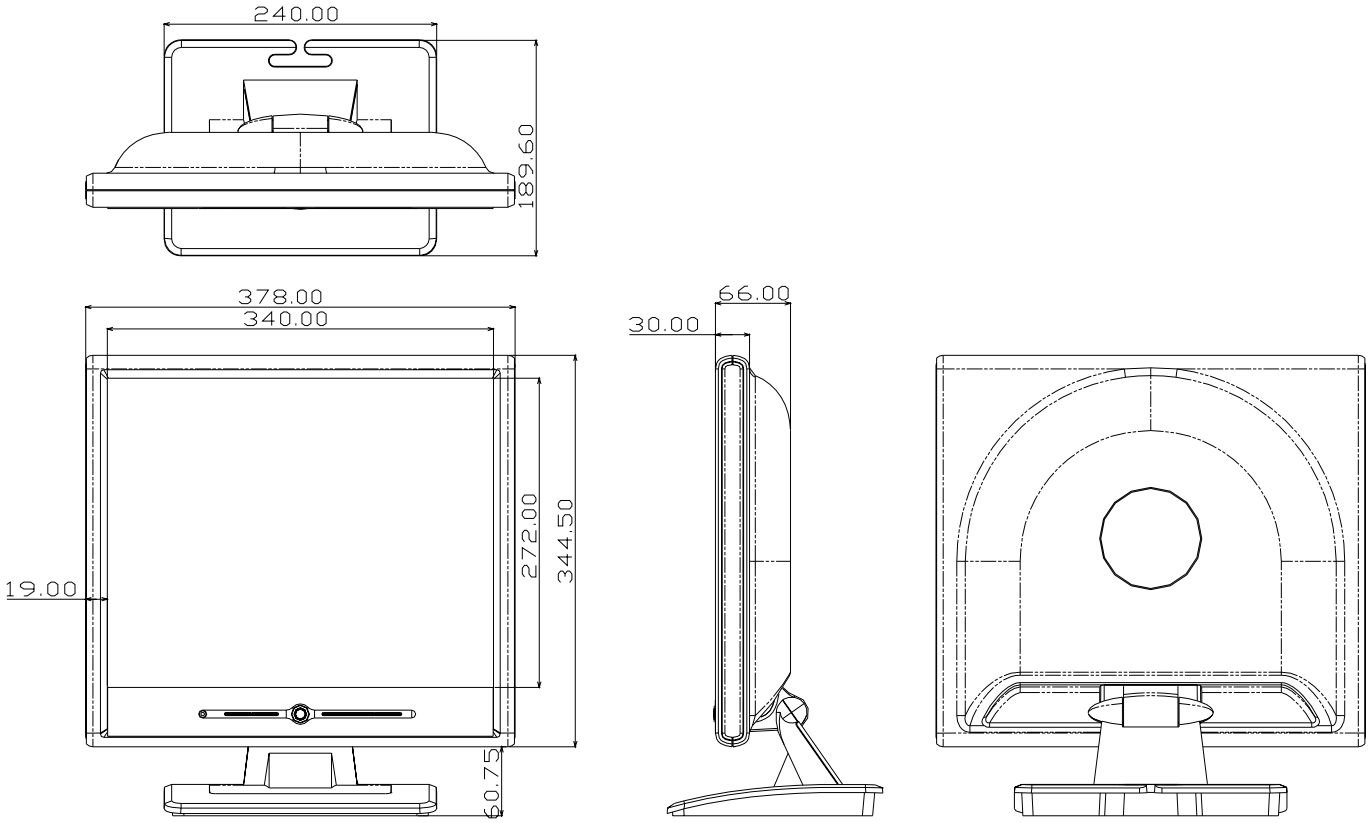


Fig. 1 **Physical Dimension Front View and Side view**

BENQ Confidential 2004-04-14 21:05:34

BENQ LCD FP767-12 Q7C3 Spare Parts List

P/N: 99.L9072.RBA/RBE

ITEM	DESCRIPTION	PART NO.	LOCATION
1	PCBA I/F BD Q7C3-12MS AU	55.L9001.021	
2	IC FLASH MTV312MV64 (AJ) PLCC4	71.31264.A03	U4
3	IC LVDS/RSDS MVPRL-HN PQPF 160P	71.MVPRL.A0E	U2
4	IC EEPROM AT24C04N-10SI-2.7SON	72.02404.N01	U3
5	IC CMOS 74LVC14A SO-N 14P	73.07414.061	U1
6	IC LR AME8815AEGT250 SOT-223	74.08815.C3C	U5
<ALT>	IC VR G950T65U SOT-223	74.95065.03C	
7	PCBA SPS BD Q7C3-12MS	55.L9002.003	
8	PCBA CTRL BD Q7C3	55.L9003.011	
9	LCDM 17" M170EN05 V8 Q7C3/AUO	56.91L90.011	
10	ASSY BZL T7032C Q7C3 (FP767-12)	60.L9001.061	
11	ASSY UC ABSHB T7032C Q7C3	60.L9002.011	
12	ASSY COLUMN ABS T7032C Q7C3	60.L9003.012	
13	ASSY BKT-MAIN Q7C3 AUSIP W/SPK	60.L9020.002	
14	CORD SVT #18*3C 10A125V US1.5M	27.01818.051	
15	CORD H05VV-3G 10A250V EURO	27.02718.051	
16	CTN B Q7C3/BENQ Q7C3	44.L9001.002	
17	CSN L EPS Q7C3/PAINTING Q7C3	47.L9013.001	
18	CSN R EPS Q7C3/PAINTING Q7C3	47.L9014.001	
19	CABLE AUD PC99PT284C/PT577C BK	50.74405.501	
20	CABLE SIGNAL 15/15P CORE*1 1.5M	50.L9005.501	
21	CD FP767-12/756-12MS Q7C3-12MS	53.L9003.001	
22	ASSY BASE ABS T7032C Q7C3	60.L9004.012	

**** THIS PARTS LIST MAY BE SUBJECT TO CHANGE WITH PRIOR NOTICE BY CSD OF BENQ.***

1. Alignment procedure (for function adjustment)

A. Preparation:

1. Setup input timing ICL-605, 32-Grays pattern.
2. Setup unit and keep it warm up at least 30 minutes.

B. Timing adjustment:

1. Enter factory setting area (press “LEFT”, “EXIT” and then press “SOFTPOWER”).
2. Check the settings to following values:

   Contrast = 50

   Brightness = 90

   Volume = 30

   OSD time = 20

   Color = sRGB

   Language = English

   Then, turn off the monitor power.
3. Turn on power enter user area.

C. Color balance adjustment:

1. Enter factory setting area (press “LEFT”, “EXIT” and then press “SOFTPOWER”).
2. Setup input timing UVGA7, 4-Grays pattern.
3. Press “AUTO”, waiting for press <right> message.
4. Press “RIGHT” to Calibrate ADC.
5. Setup input timing ICL-605, 32 -Gray pattern.
6. Checking if the picture is no good, reject this monitor.

D. Color adjustment:

1. Setup input timing ICL-605, white pattern.
2. Measure color temperature by Minolta CA-110 (or equivalent equipment).
3. Alignment the color temperature Bluish, Reddish & sRGB. The color temperature specification as follows:

White Balance (Bluish, 9300K set on OSD)	X+- Y+-	0.283+(-) 0.03 0.297+(-) 0.03
White Balance (Reddish, 5800K set on OSD)	X+- Y+-	0. 326+(-) 0.03 0. 342+(-) 0.03
White Balance (sRGB, 6500K set on OSD)	X+- Y+-	0.313+(-) 0.03 0. 329 +(-) 0.03

4. Turns off the monitor power.

E. Writing EDID file:

1. Setup a PC with DDC card.
2. Connect PC to monitor with a D-sub signal cable.
3. Please refer to the C212 for the correct EDID file.
4. Runs the writing program to write the EDID file into EEPROM for analog input, ie. 15-pin D-sub.
5. Read both EEPROM data and confirm it to match with the C212 document definition.

F. Command definition:

MCU COMMAND LIST					
FUNCTION	BYTE1	BYTE2	BYTE3	BYTE4	
Write Contrast	CA	55	Data	checksum	
Write Brightness	CA	56	Data	checksum	
Write Red Gain	CA	57	Data	checksum	
Write Green Gain	CA	58	Data	checksum	
Write Blue Gain	CA	59	Data	checksum	
Read Contrast	C3	55	XX	checksum	
Read Brightness	C3	56	XX	checksum	
Read Red Gain	C3	57	XX	checksum	
Read Green Gain	C3	58	XX	checksum	
Read Blue Gain	C3	59	XX	checksum	
Write C1 (Bluish) R-Gain Data to NVRAM	AA	3C	Data	checksum	
Write C1 (Bluish) G-Gain Data to NVRAM	AA	3D	Data	checksum	
Write C1 (Bluish) B-Gain Data to NVRAM	AA	3E	Data	checksum	
Write C2 (Reddish) R-Gain Data to NVRAM	AA	4C	Data	checksum	
Write C2 (Reddish) G-Gain Data to NVRAM	AA	4D	Data	checksum	
Write C2 (Reddish) B-Gain Data to NVRAM	AA	4E	Data	checksum	
Write C3 (sRGB) R-Gain Data to NVRAM	AA	5C	Data	checksum	
Write C3 (sRGB) G-Gain Data to NVRAM	AA	5D	Data	checksum	
Write C3 (sRGB) B-Gain Data to NVRAM	AA	5E	Data	checksum	
Write User R-Gain Data to NVRAM	AA	6C	Data	checksum	
Write User G-Gain Data to NVRAM	AA	6D	Data	checksum	
Write User B-Gain Data to NVRAM	AA	6E	Data	checksum	
Read C1 (Bluish) R-Gain data from NVRAM	A3	3C	XX	checksum	
Read C1 (Bluish) G-Gain data from NVRAM	A3	3D	XX	checksum	
Read C1 (Bluish) B-Gain data from NVRAM	A3	3E	XX	checksum	
Read C2(Reddish) R-Gain data from NVRAM	A3	4C	XX	checksum	
Read C2 (Reddish) G-Gain data from NVRAM	A3	4D	XX	checksum	
Read C2 (Reddish) B-Gain data from NVRAM	A3	4E	XX	checksum	
Read C3 (sRGB) R-Gain data from NVRAM	A3	5C	XX	checksum	
Read C3 (sRGB) G-Gain data from NVRAM	A3	5D	XX	checksum	
Read C3 (sRGB) B-Gain data from NVRAM	A3	5E	XX	checksum	

Read User R-Gain data from NVRAM	A3	6C	XX	checksum	
Read User G-Gain data from NVRAM	A3	6D	XX	checksum	
Read User B-Gain data from NVRAM	A3	6E	XX	checksum	
Change Color Temperature to C1	CC	1	XX	checksum	
Change Color Temperature to C2	CC	2	XX	checksum	
Change Color Temperature to C3	CC	3	XX	checksum	
Change C/T to User	CC	4	XX	checksum	
User mode to factory mode	1A	5A	XX	checksum	
Auto Color (Offset1, Offset2, Gain)	1B	5A	XX	checksum	
Factory mode to User mode	1E	5A	XX	checksum	
Clear user area data	1F	5A	XX	checksum	
Off burn in mode	CE	2	XX	checksum	
Change Language Setting	66	0~7	XX	checksum	
Read EEPROM Contrast	A3	92	XX	checksum	
Read EEPROM Brightness	A3	93	XX	checksum	
Read EEPROM C/T Point	A3	94	XX	checksum	
Read EEPROM OSD-Hpos	A3	95	XX	checksum	
Read EEPROM OSD-Vpos	A3	96	XX	checksum	
Read EEPROM Language	A3	97	XX	checksum	
Read EEPROM OSD Timer	A3	98	XX	checksum	
Read EEPROM Volume	A3	99	XX	checksum	

Table 1

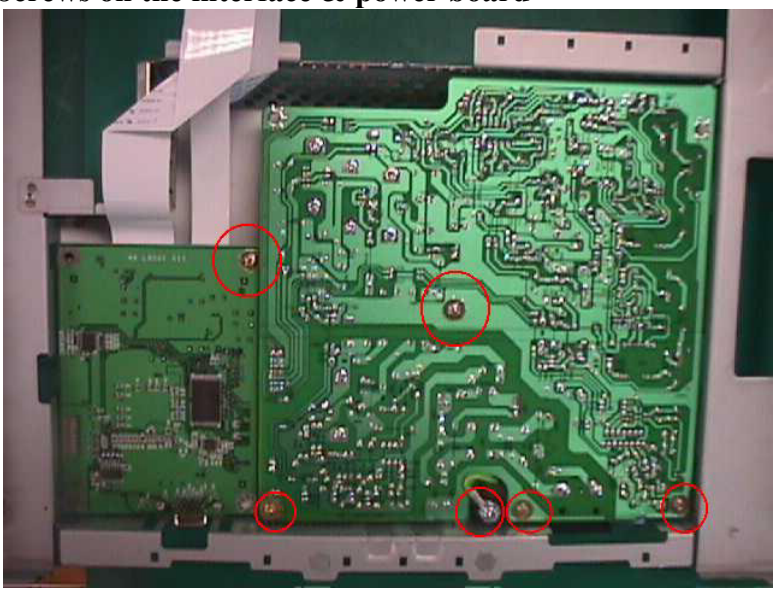
When PC Host sends 0x7D command to MCU, MCU must return as following (2 bytes)

Return Code	R-Byte1	R-Byte2
Checksum error code	FC	AA
Normal return code	the above Byte3 (/data)	FC
If normal return code is exact FCh	FC	CF

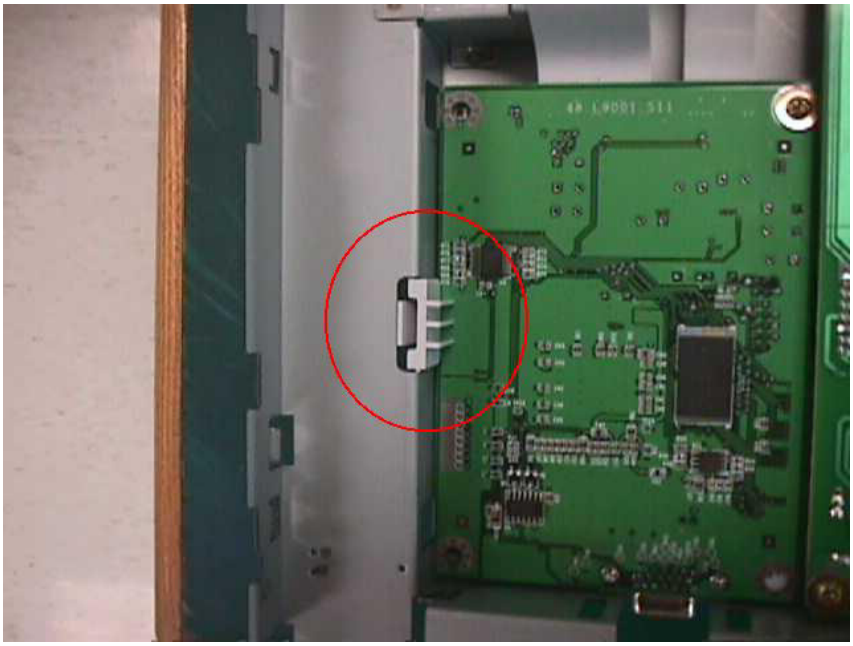
2. Dressing

A. Check the two spring on the BKT

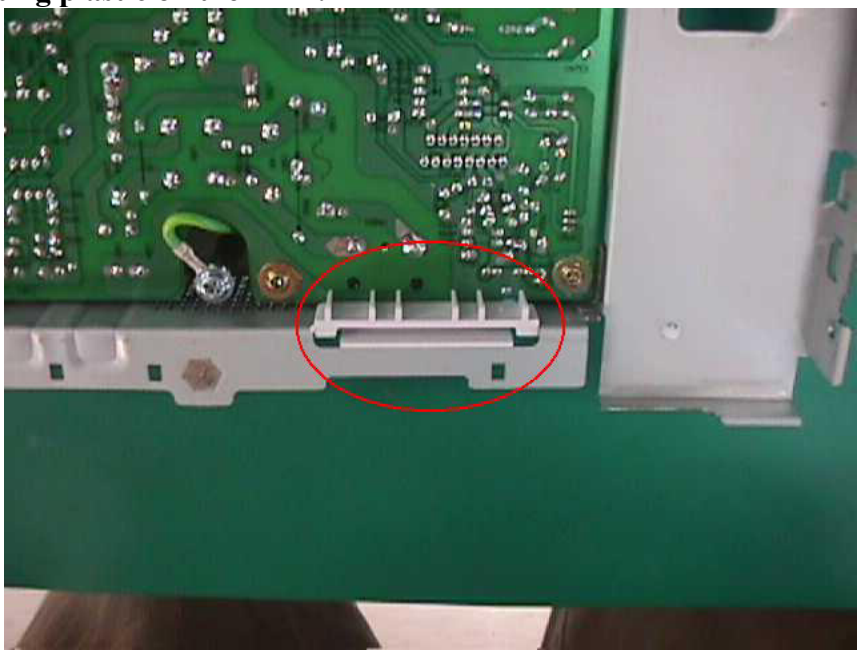
B. Screws on the interface & power board



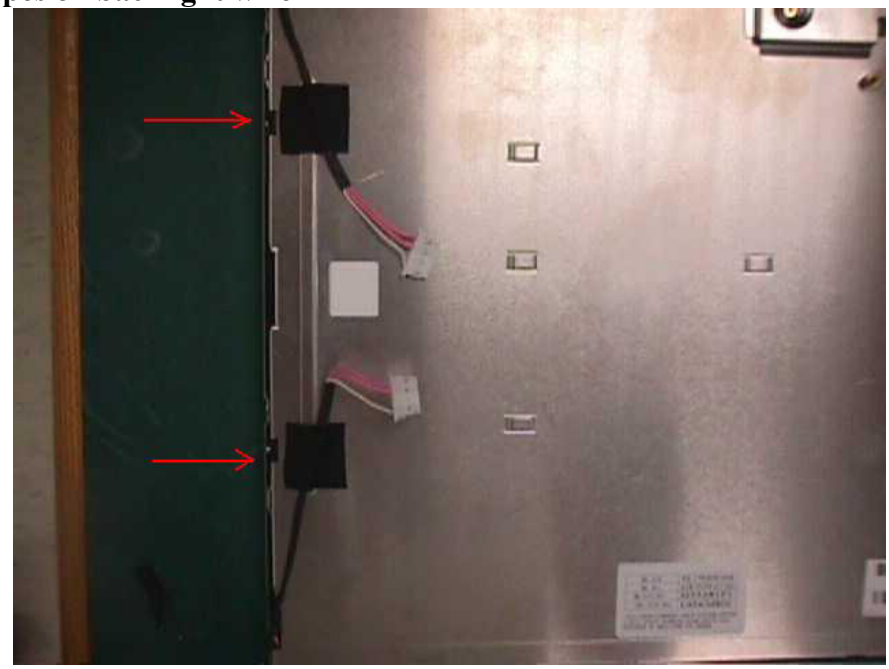
C. Plastic fixture on the interface board



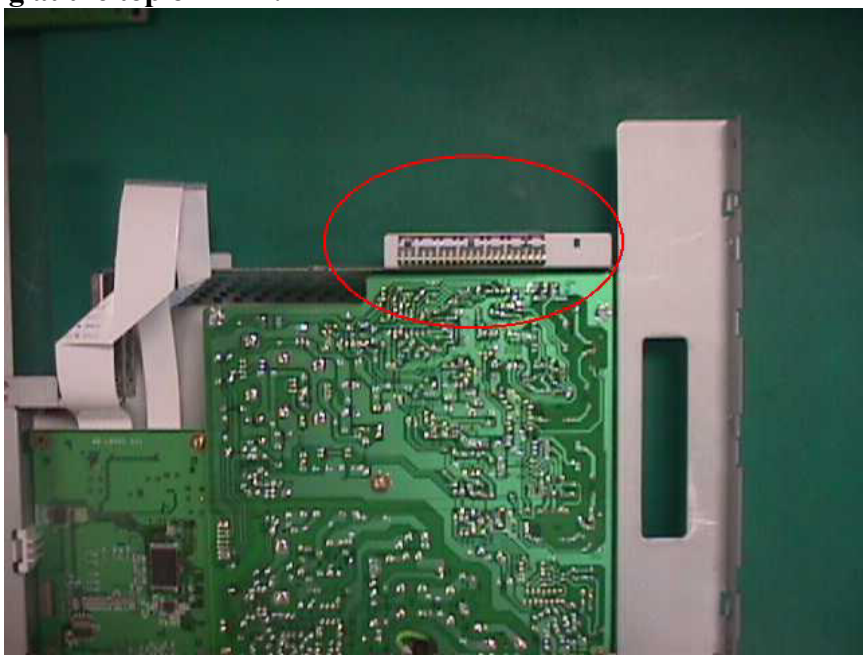
D. Closing plastic on the BKT:



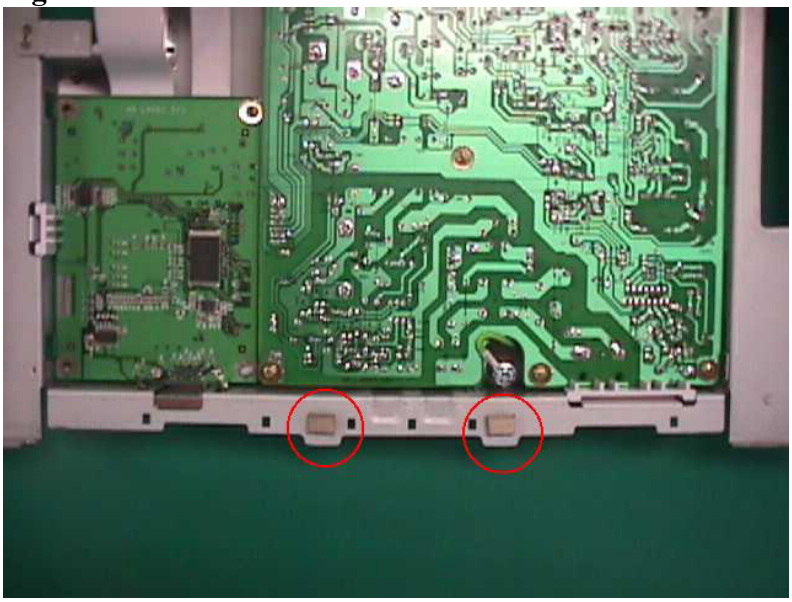
E. Tapes on backlight wire



F. Spring at the top of BKT:



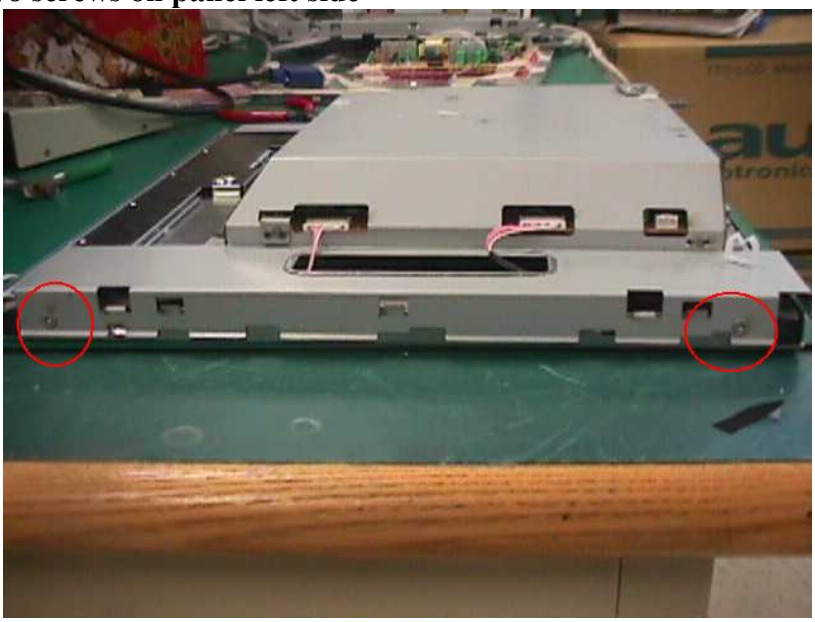
G. Two gaskets at the bottom of BKT



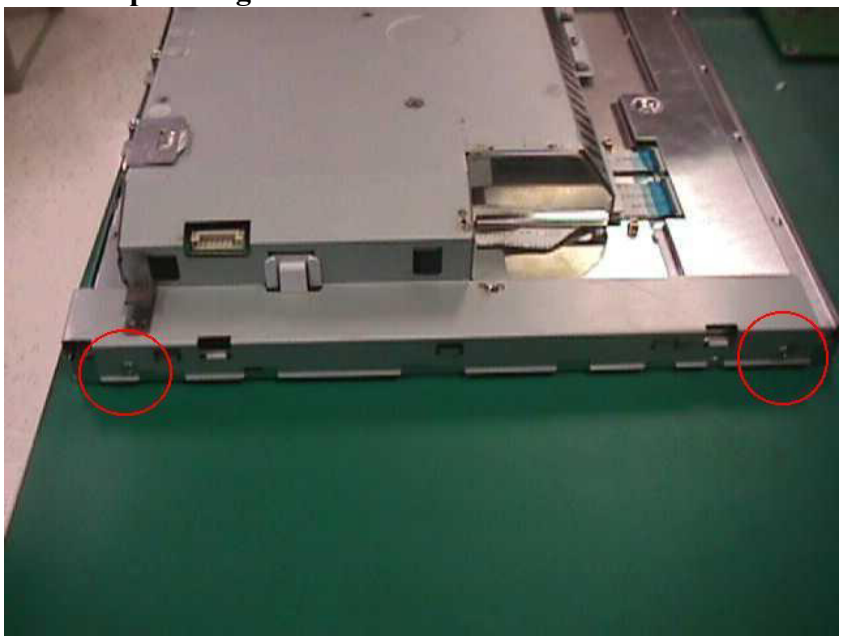
H. Place D-sub cover and its screw

I. Backlight wire

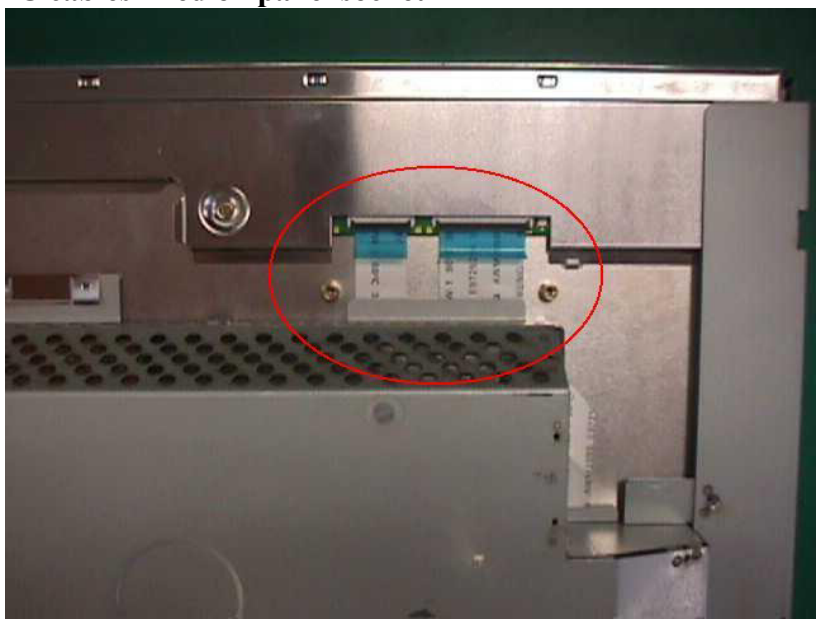
J. Two screws on panel left side



K. Two screws on panel right side

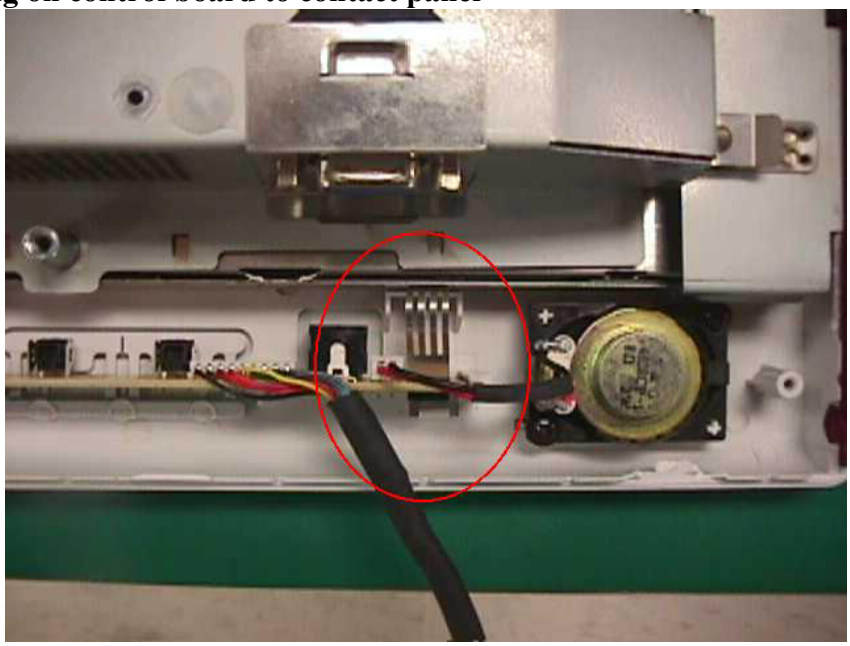


L. Two FFC cables fixed on panel socket

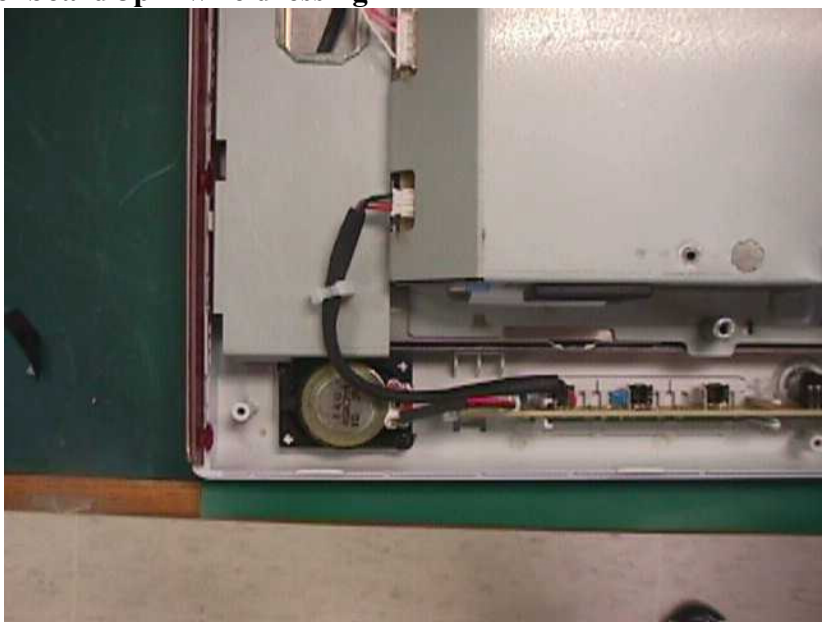


M. Two speakers fixed on BZL

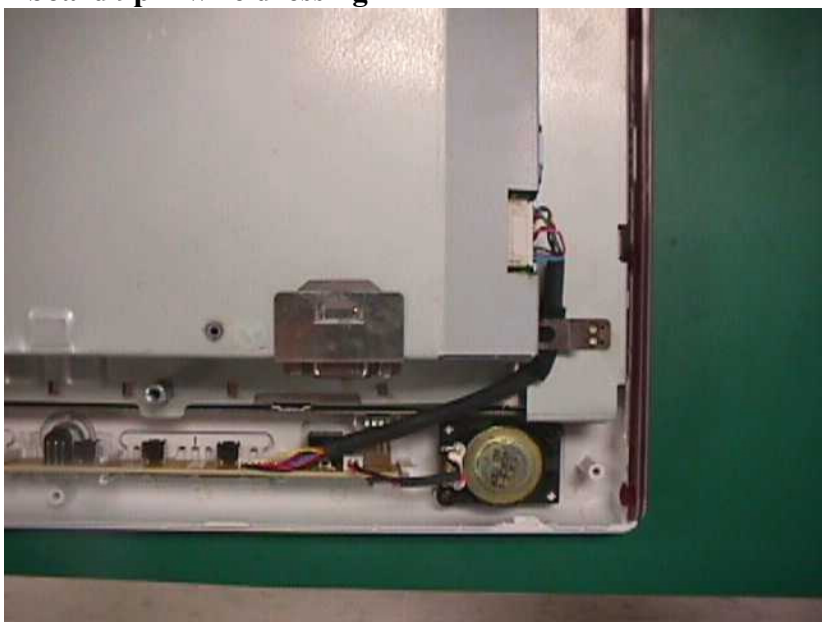
N. Spring on control board to contact panel



O. Control board 3pin wire dressing



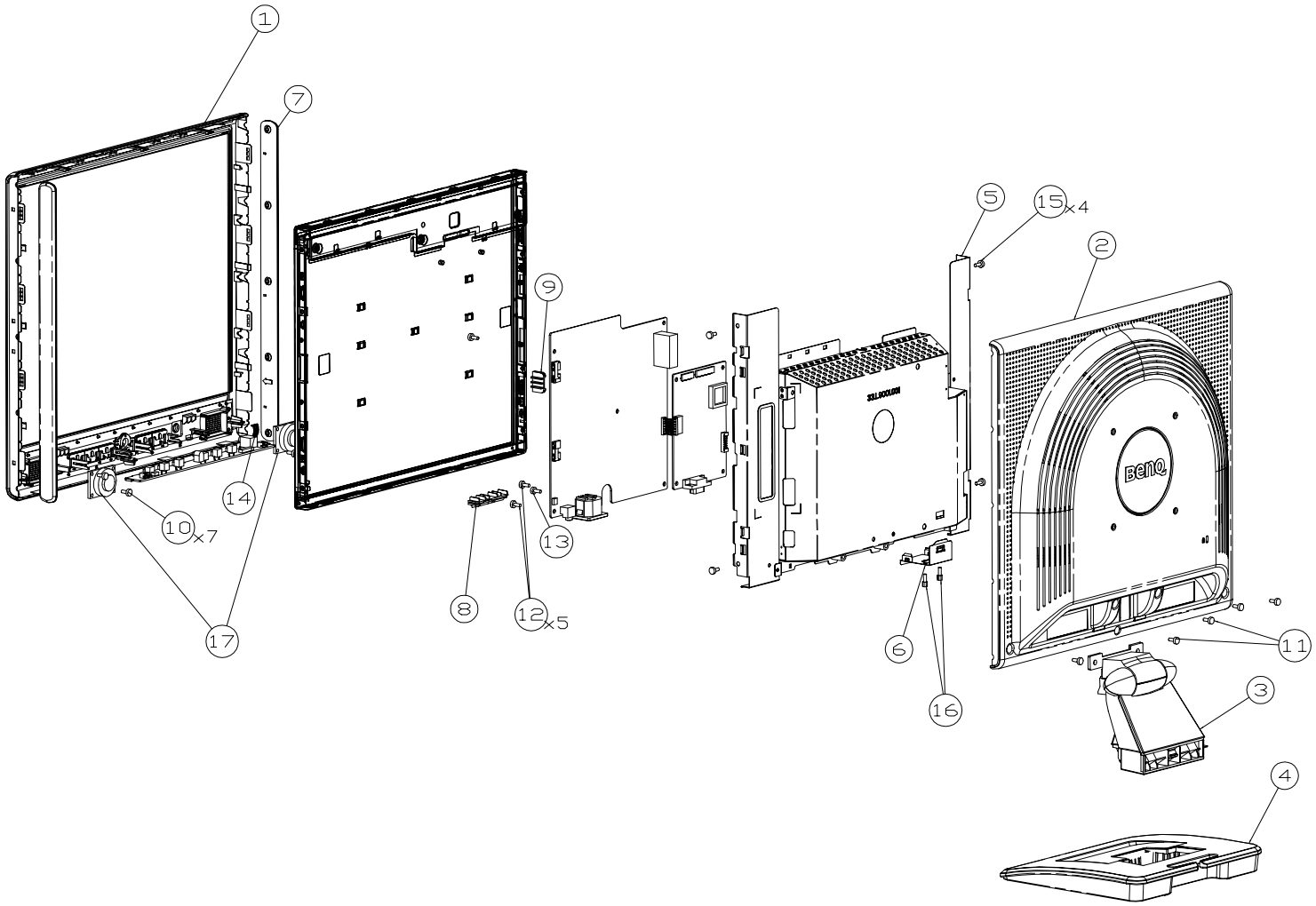
P. Contorl board 9pin wire dressing



Q. Paste aluminum tape on the backlight wire hole

PART NO	REV	SYMBOL	DESCRIPTION	LOCATED	REASON	SIGN	DATE
	A		FIRST RELEASE			Simon Ho	

Item	Part NO	Description	Q'Ty
1	60.L9001.001	ASSY-BEZEL	1
2	60.L9002.00A	ASSY-REAR-COVER	1
3	60.L9003.00A	ASSY-COLUMN	1
4	60.L9004.00A	ASSY-BASE	1
5	60.L9005.001	ASSY-BKT-MAIN	1
6	34.L9002.002	D-SUB-COVER	1
7	42.L9008.001	SIDE-COVER	2
8	42.L9017.001	COVER-AC	1
9	42.L9016.001	HOLDER-INTER	1
10	86.WA314.8R0	SCREW M3*8mm	7
11	86.1A356.10A	MACH M4*10 NYLON	2
12	86.00273.6R0	SCREW M3*6C-ZN	5
13	86.V7526.6R0	TAP M4*10 ZN	1
14	34.L9007.003	SPG-CTRL 0.2mm	1
15	86.5A524.6R0	SCREW M3*6 NI	4
16	86.20F84.019	SCREW	2
17	23.4L470.501	speaker	2



SCALE 0.600

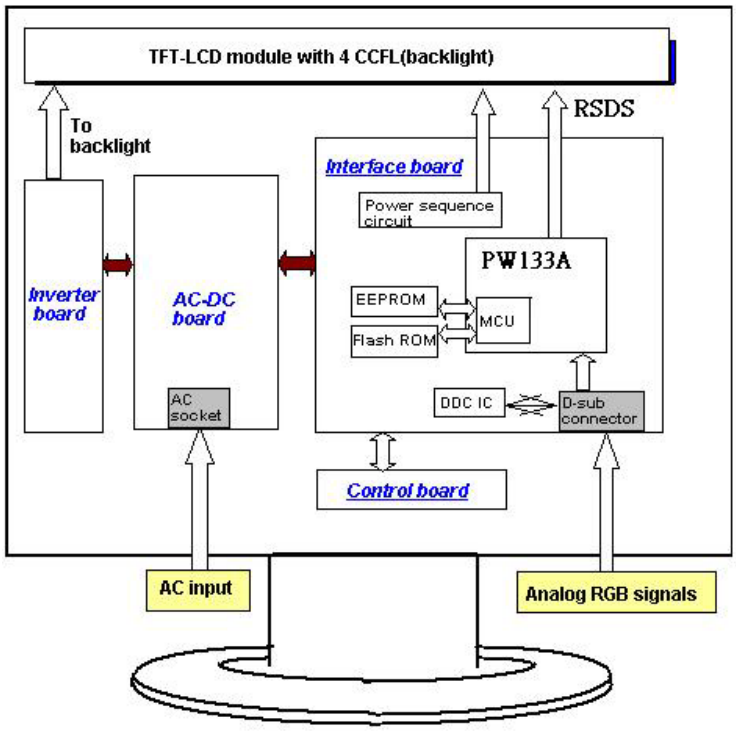
MODEL	Q7C3	NAME	ASSY-EXPLODE			TOLERANCE UNLESS OTHERWISE SPECIFIED (+/-)						
DRN	Simon Ho	MATERIAL				CLASS	A	B	C	D	E	F	G
DSN	Simon Ho	FINISH				< 6mm	SAME AS	0.1	0.1	0.2	0.2	0.4	0.4
CKD	Aaron Ho	SCALE		DIM IN	mm	6 ~ 30mm	SAME AS	0.2	0.3	0.3	0.4	0.6	0.6
APPD	Peter Wu	SHEET	1 OF 1	CAVITIES		30 ~ 120mm	SAME AS	0.3	0.4	0.4	0.5	0.8	1.0
						120 ~ 315mm	SAME AS	0.4	0.5	0.6	0.8	1.2	1.5
						315 ~ 1000mm	0.5	0.6	0.8	1.0	1.5	2.0	3.0
						> 1000mm	1.0	1.0	1.5	1.7	3.0	4.0	6.0
						ANGLE	±1°						
Benq Corporation						FILE NAME							
						PART NO.							

I. Introduction:

The Q7C3 (FP756) is a 17" SXGA (1280x1024) , 262 K colors(R, G, B 6-bit data) TFT LCD monitor without multi-media function. It's an analog interface LCD monitor with a 15 pins D-sub signal cable and it's compliant with VESA specification to offer a smart power management and power saving function. It also offers OSD menu for users to control the adjustable items and get some information about this monitor, and the best function is to offer users an easy method to set all adjustable items well just by pressing one key, we called it "Auto key" which can auto adjusting all controlled items. Q7C3 (FP756) also offer DDC2 function to meet VESA standard.

II. Block diagram

The Q7C3 (FP756) consists of a head and a stand (base). The head consists of a LCD module with 4 lamps, a power board (include AC/DC, DC/DC and inverter board), a control board and interface BD. The block diagram is shown as below.

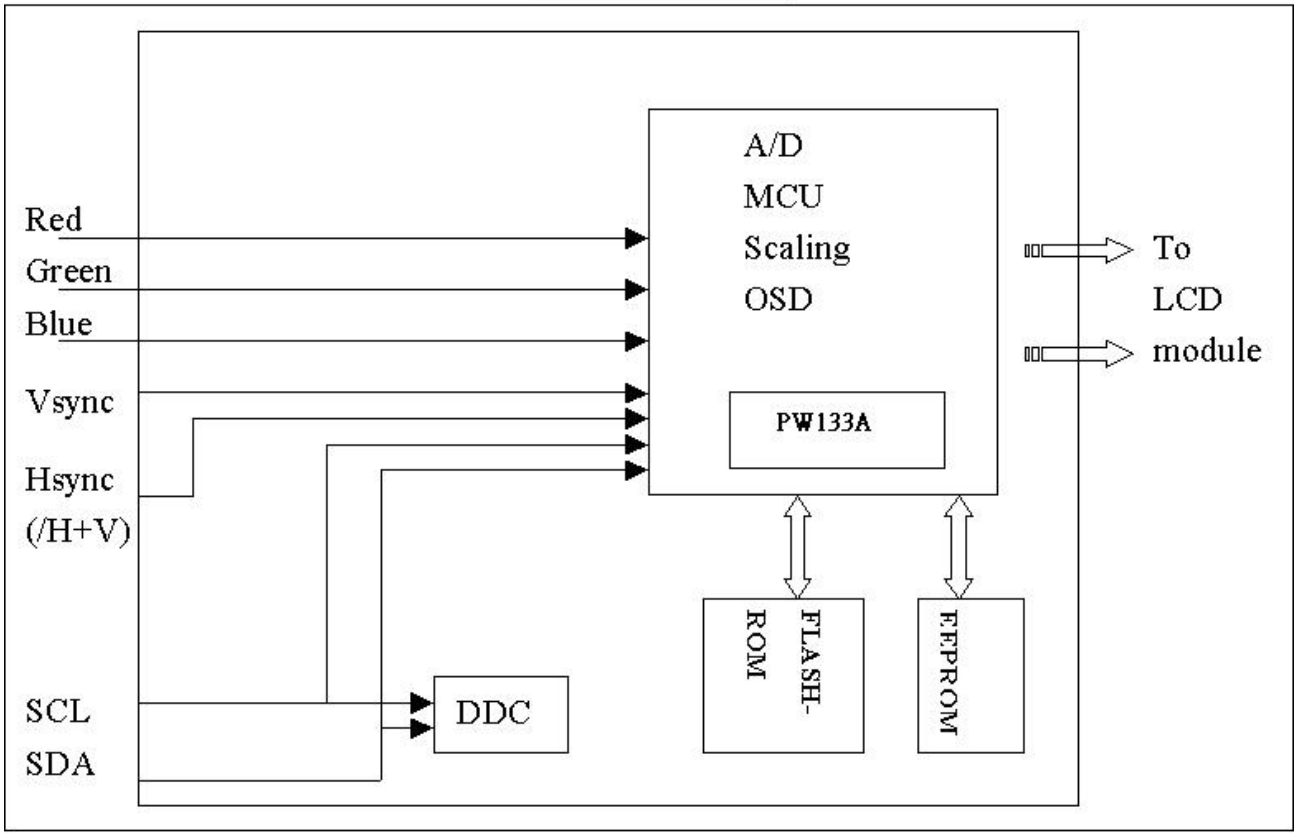


III. Circuit operation theory:

A.) HEAD:

A-1.) Interface board diagram:

Interface Board



(a) Circuit operation theory:

A basic operation theory for this interface board is to convert analog signals of Red, Green, Blue. The scaling IC has internal A/D converter, internal OSD and auto detect input timing functions. A/D converter is convert analog signal to digital data. OSD is offering adjustable functions to end-user. Detect timing is for detect change mode. Scalar finally output the digital RGB data, the Hsync, Vsync and pixel clock to LCD panel driver IC by RSDS interface. MCU also embedded in PW133A controls system processing. EEPROM is stored DDC data, OSD common data and user mode data. Flash-Rom is stored the source code which is accessed by MCU to run program.

(b) IC introduction:

1.) DDC (Display Data Channel) function: We use DDC IC to support DDC/2B function. DDC data is stored in 24C02(EEPROM). Those data related to LCD monitor specification. PC can read them by “SDA” and “SCL” serial communication for I^2C communication for DDC2B.

2.) PW133A IC : There are A/D, Scaling, OSD, MCU functions in the PW133A IC. Scaling IC is revolutionary scaling engine, capable of expanding any source resolution to a highly uniform and sharp image, combined with the critically proven integrated 8 bit triple-ADC and patented Rapid-lock digital clock recovery system. It also support detect mode and DPMS control. MCU

control unit, it controls all the functions of this interface board, just like the OSD display setting, the adjustable items, adjusted data storage, the external IIC communication, support DDC2B.

3.) EEPROM: We use 24C16 to store all the adjustable data and user settings.

4.) FLASH ROM: To stored the source code which is accessed by MCU to run program.

A-2.) Power board diagram:

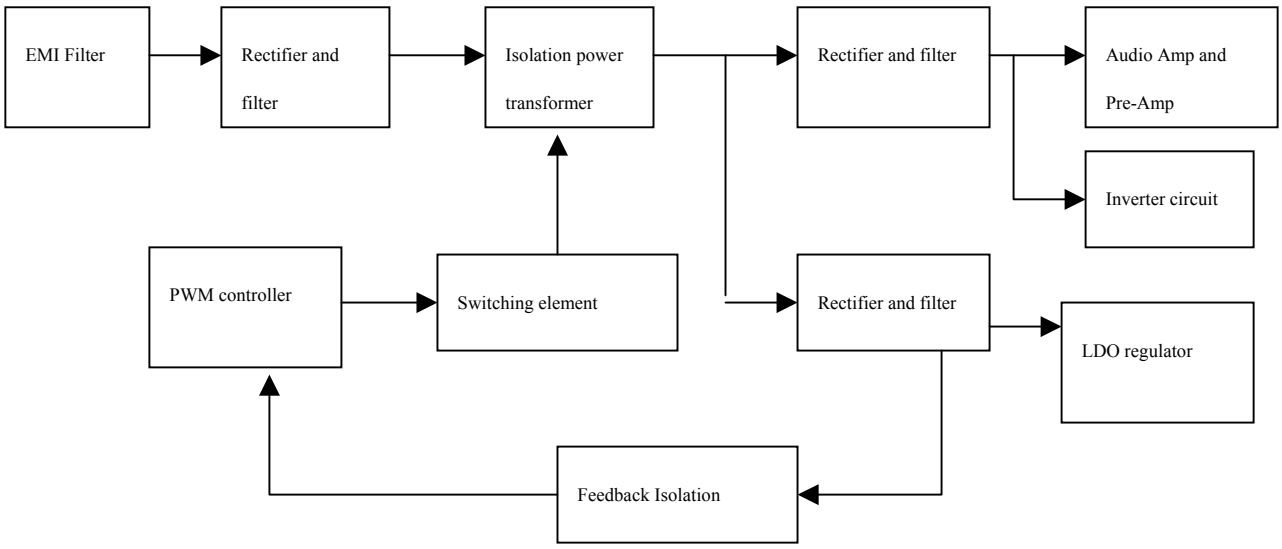


Fig.1

#1 EMI Filter

This circuit (fig. 2) is designed to inhibit electrical and magnetic interference for meeting FCC, VDE, VCCI standard requirements.

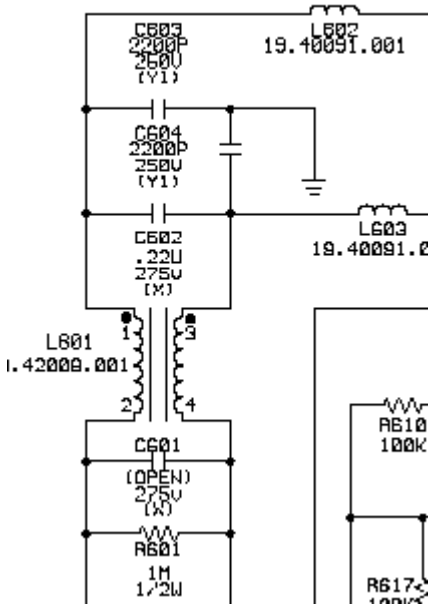


Fig. 2

#2 Rectifier and filter

AC Voltage (90-264V) is rectified and filtered by BD601, C605 (See Fig 3) and the DC Output voltage is 1.4*(AC input). (See Fig.3)

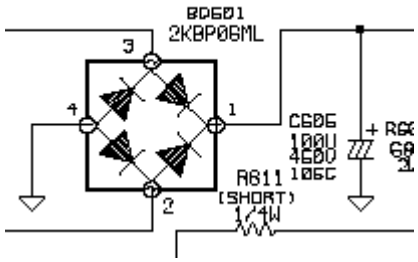


Fig. 3

#3 Switching element and Isolation power transformer

When the Q601 turns on, energy is stored in the transformer. During Q601 turn-off period, the stored energy is delivered to the secondary of transformer. R607, C607 and D601 is a snubber circuit. R615 is current sense resistor to control output power. (See Fig.4)

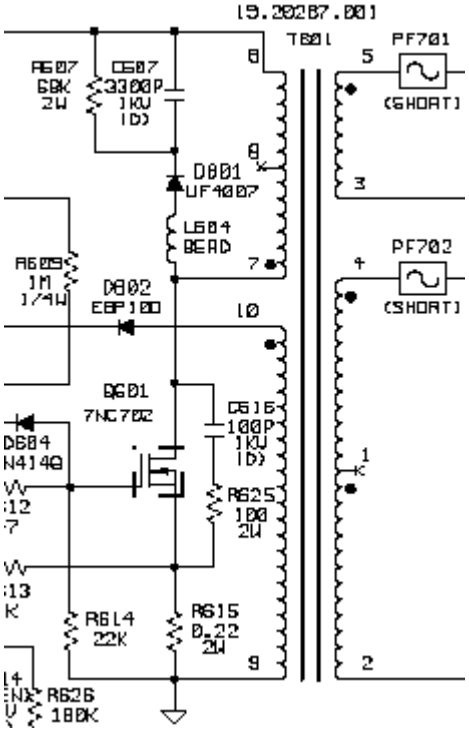


Fig. 4

#4 Rectifier and filter

D701 and C703 are to produce DC output. L701 and C704 are to suppress high Frequency switching spikes. (See Fig.5)

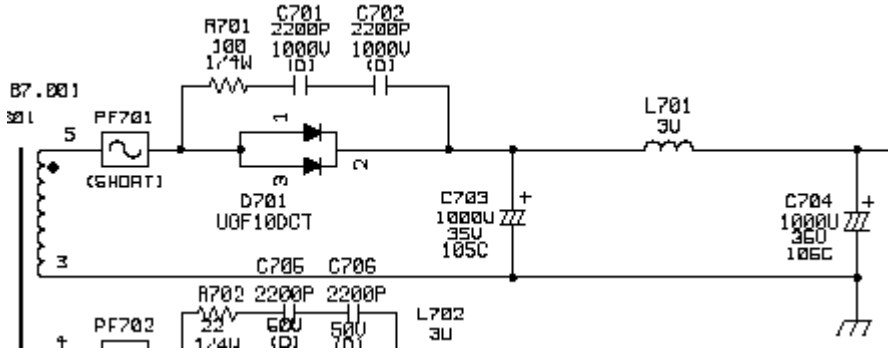


Fig. 5

#5 PWM Controller

The PWM controller NCP1200A implements a standard current mode architecture. With an internal structure operating at a fixed 40KHz. Where the switch time is dictated by the peak current set-point. When the current set-point falls below a given value. The output power demand diminishes, the IC automatically enters the so-called skip cycle mode and provides excellent efficiency.

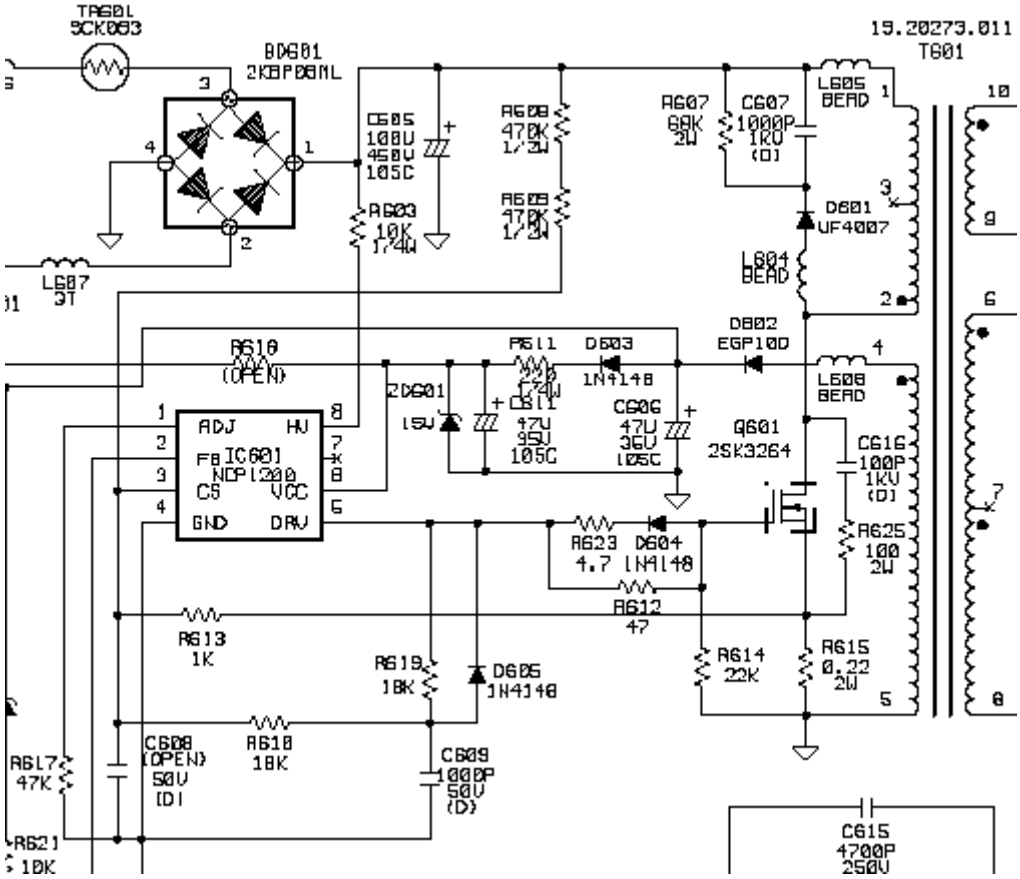


Fig. 6

#6 Feedback circuit

PC123 is a photo-coupler and TL431 is a shunt regulation. They are used to detect the output voltage change and be the primary and secondary isolation. When output voltage changes, the feedback voltage will be compared and duty cycle will be decided to control the correct output voltage. (See Fig.7)

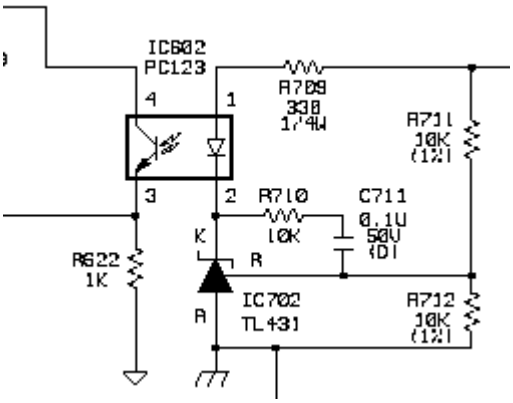
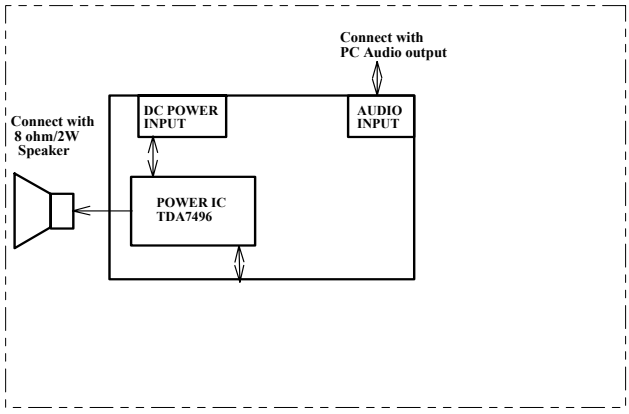


Fig. 7

#7.Audio Speaker:



The Audio Speaker is consisting of an Audio board. The Audio Speaker has DC Volume control, use 28mmX40mm Speaker (2W/per channel), power supply from AC-DC board and Audio input from PC Audio output (Line Out).

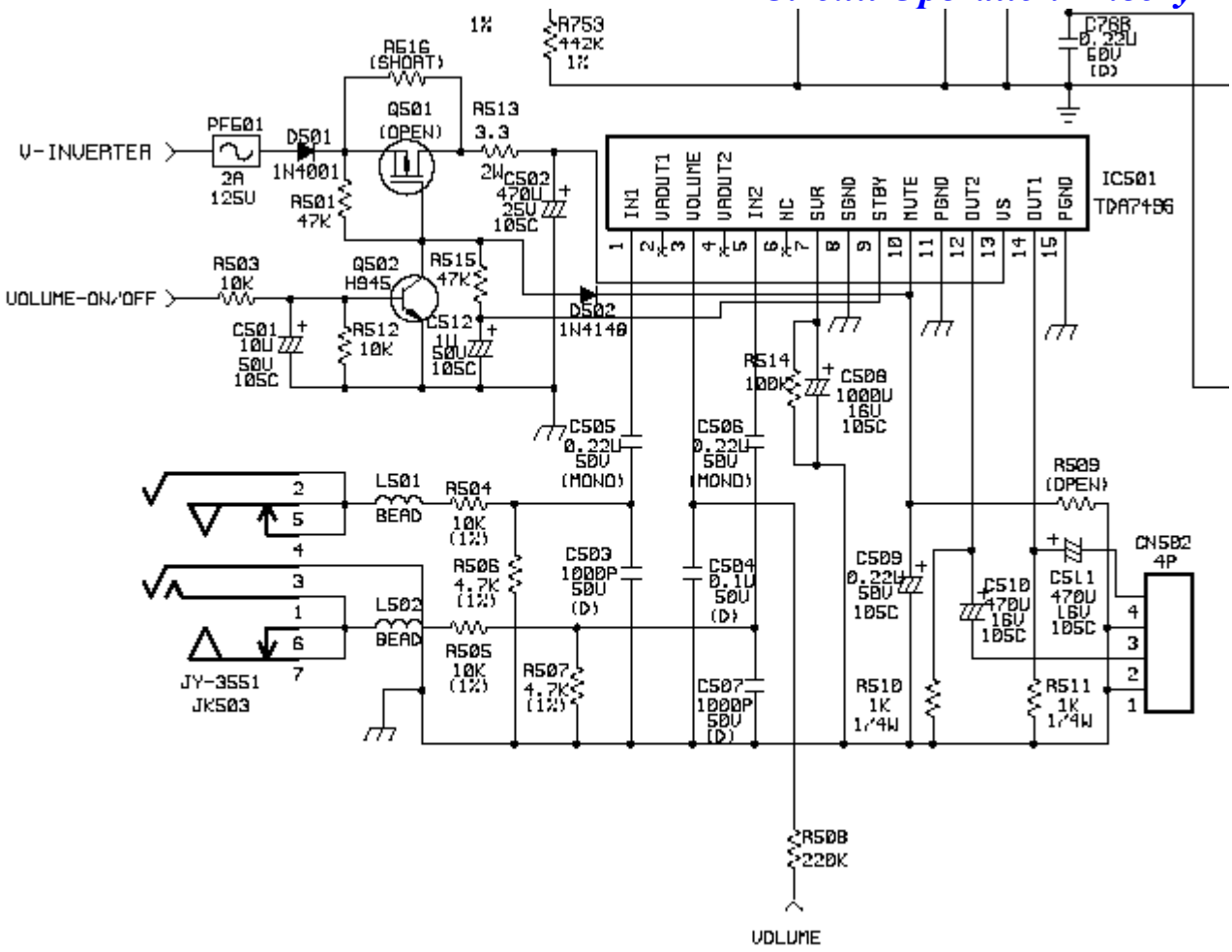
(A) Power IC: Use ST POWER IC TDA7496.The IC are stereo Class AB output amplifiers with DC Volume control. The devices are designed for use in TV and monitor, but are also suitable for battery-Fed portable recorders and radios. Use +15V from AC-DC Board and connect speaker to offer 1W per channel.

(B) DC Power Input: To supply +15V to be VCC source Voltage for TDA7496 and built-in AC-DC board.

(C) Audio Input: connect with PC Audio output in 3.5mm to 3.5mm signal line.

(D) Speaker: Use 8 ohm and 28mmX40mm speaker (2W/per channel)

(E) DC Volume Control: The voltage range is 1 – 3.3 V (From MC)



A-3.) Control board introduction:

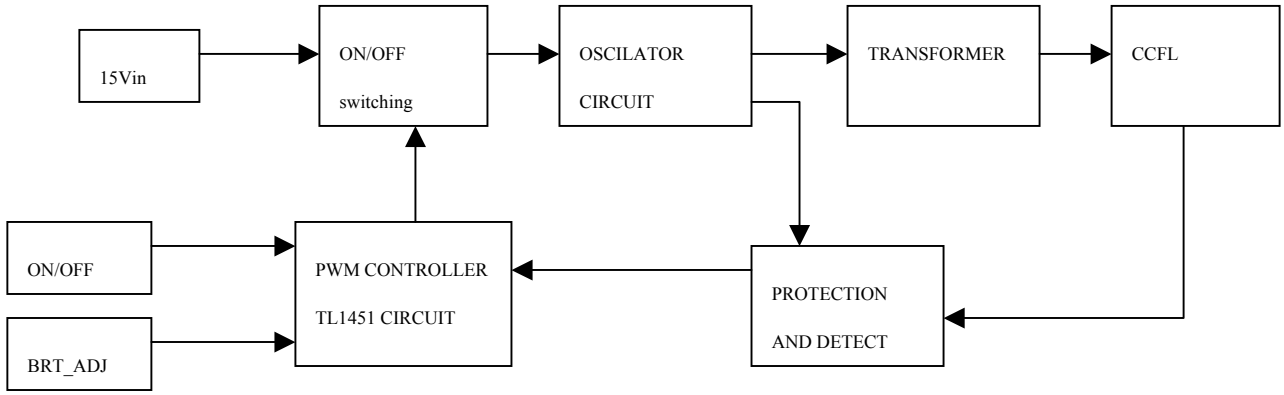
The main parts of the control board are a push button, and a LED.

(a) Push button: It's a simple switch function, pressing it for "ON" to do the auto adjustment function, releasing it for "OFF" to do nothing.

(c) LED: It indicates the DPMS status of this LCD monitor; green light means DPMS on (Normal operating condition). Amber light means DPMS off (Power off condition).

A-4.) Inverter diagram:

1.**Block Diagram:**



2. General Specification

Input Voltage: 15V

Input Current: 2A max.

ON/OFF Voltage: 3.3V

PWM Duty: 3.3V/47KHz

Output Requirement:

Max. Output Current: 15mA

Min. Output Current: 6mA

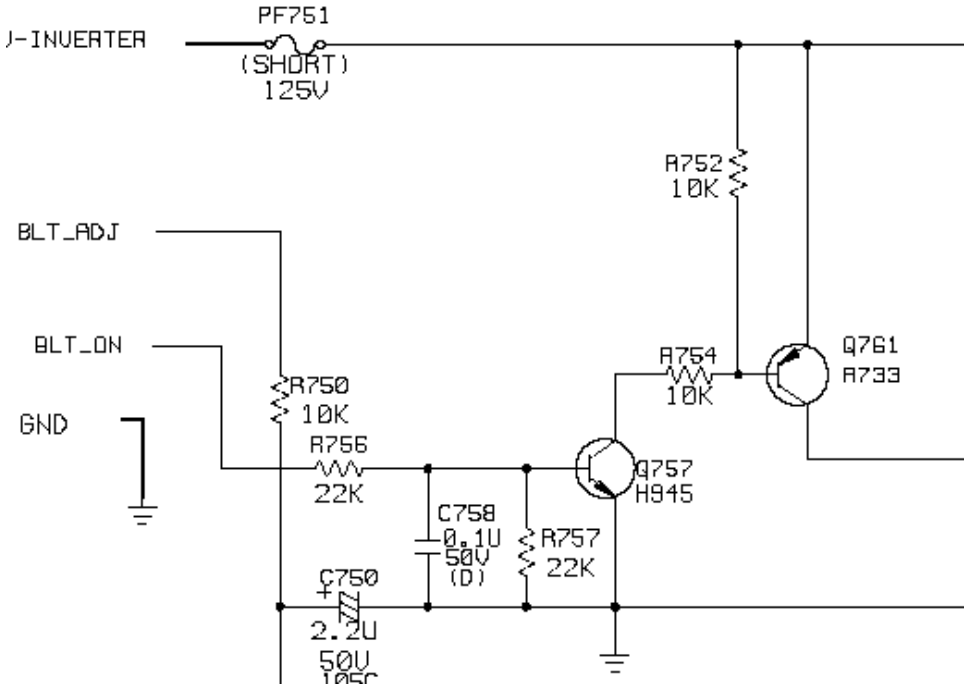
Lamp Working Voltage: 600Vrms

Open Lamp Voltage: 1700Vrms

Frequency: 50KHz

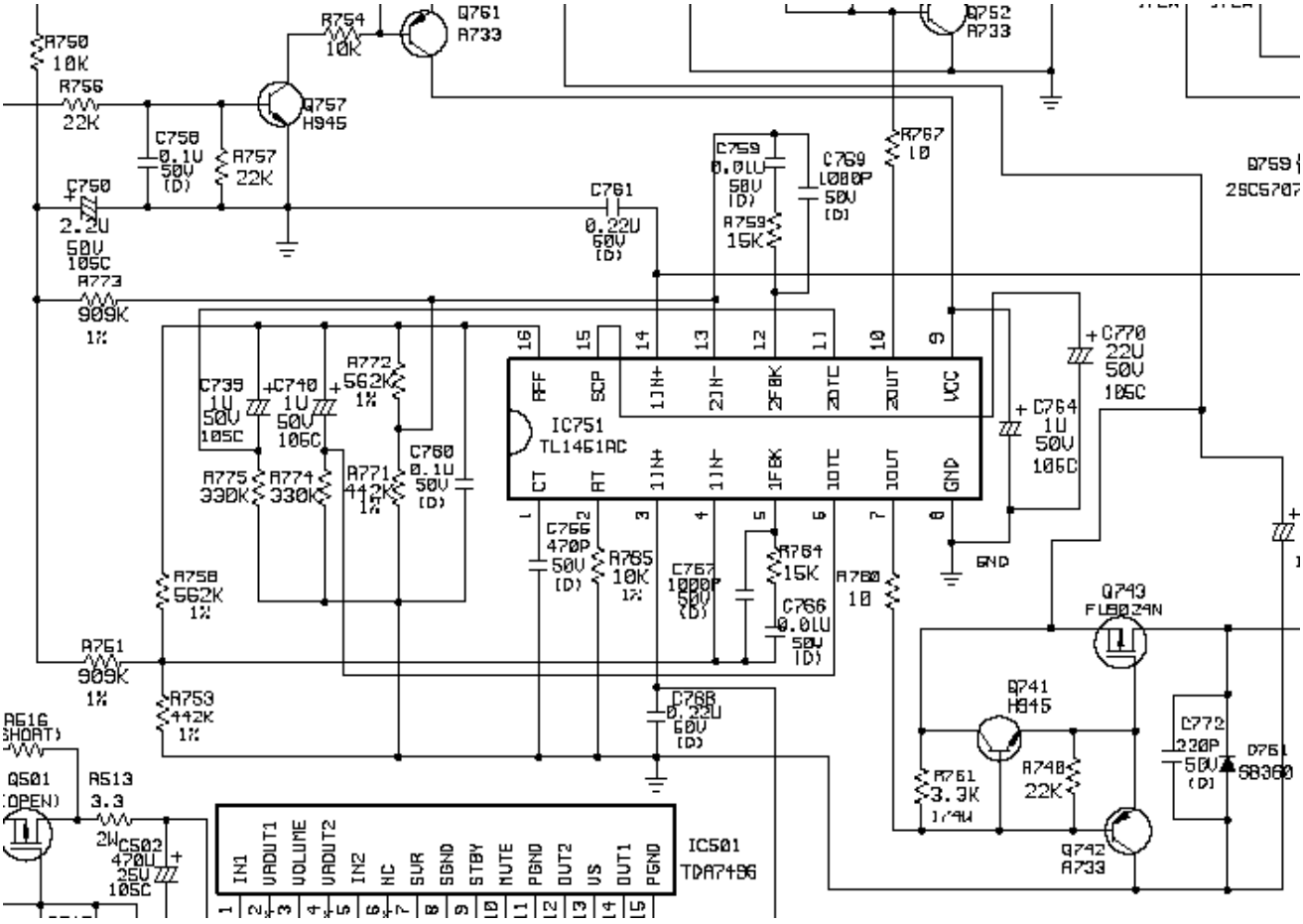
3.Circuit Operation Theorem

3.1 ON/OFF SWITCH



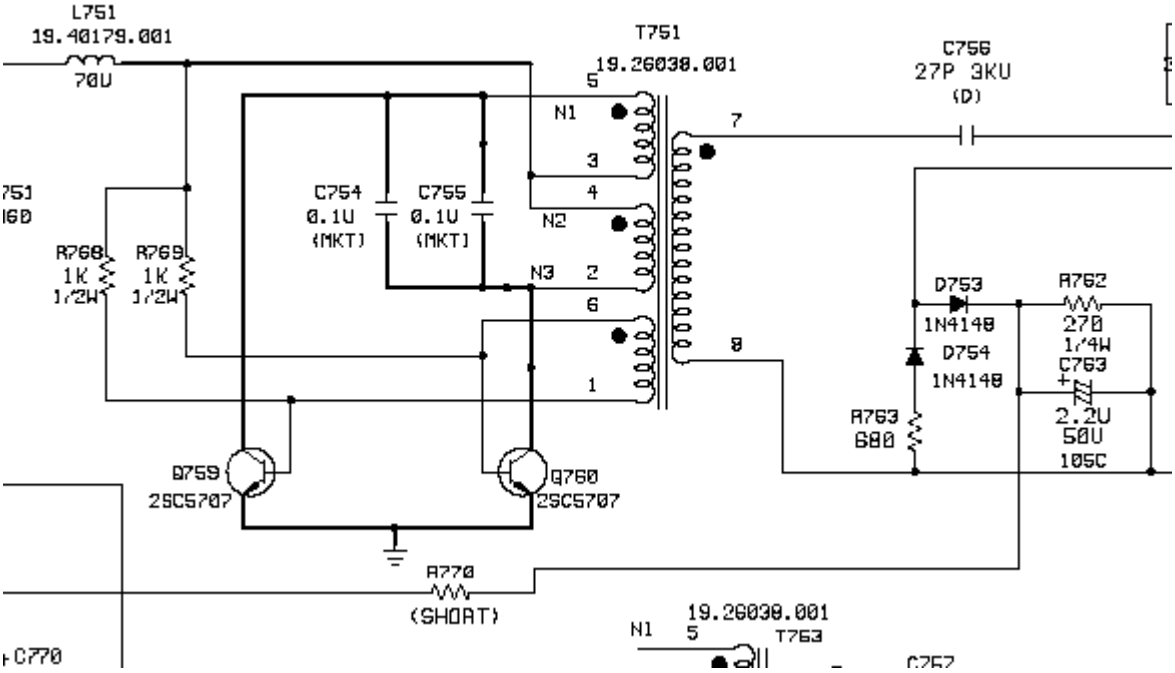
The turn-on voltage was controlled by R756 and R757.The inverter was turned on or off by the switching transistors Q761 and Q757, Also regulator IC751 is control by Q761 and Q757 decide supply 15V to inverter part or instead.

3.2 PWM Control circuit

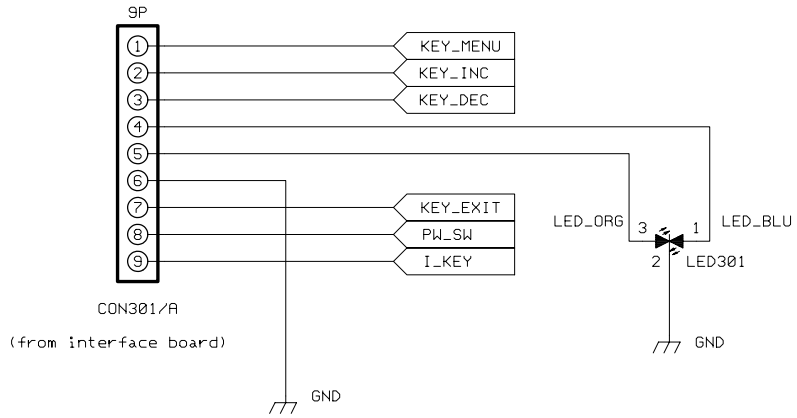


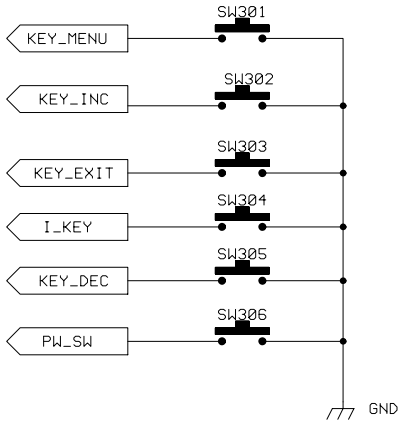
TL1451 is a dual PWM controller.C765 and R765 decide the working frequency.BLT_ADJ signal is from control board, control pulse width then decide how much energy delivery to CCFL also decide CCFL brightness. Q741 and Q742 be the buffer to rise the drive capability and the totem poles circuit can improve a capable of driving for Q743.C770 decide the striking time delay.

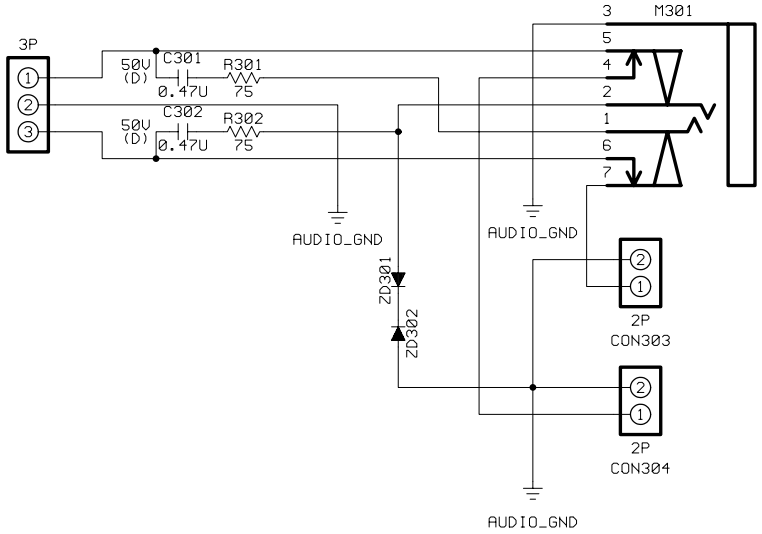
3.3 Oscillator Circuit

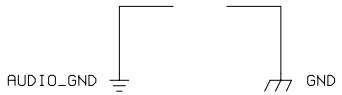


Royer circuit uses the characteristic of transformer saturation to oscillate. When the DC power inject, Q759 or Q760 will turns on, and the current Ic increases. After a period, the transistor will leave the saturation status and Vce increase. The result causes the voltage of primary coil get lower. Finally the transistor turn off, and another transistor turn on. These statuses are repeated and the pin7 and pin8 of T751 will get a Sin Wave to turn on CCFL.









NOTES:
1. Resistor values are in ohm, K=1,000 ohm, M=1,000,000 ohm
2. All resistors are 1/8 watt, 5% except where otherwise indicated
3. ⏚ ⏚ ⏚ Represents PCB common ground.

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Q7C3 CTRL BD SCHEMATICS			
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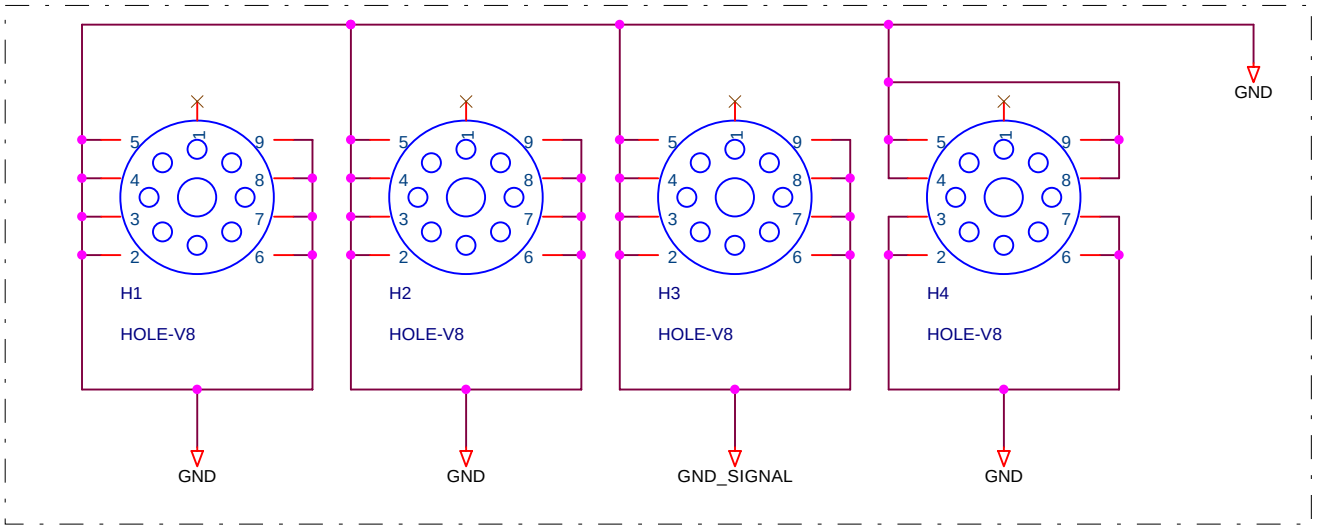
Doc.No. 99.L9072.000-C3-304-003			
Prepared By	Reviewed By	Approved By	
ANGEL HU 6/13/2003	WAIT CHEN 6/13/2003	DAVEN WU 6/13/2003	

Screw Holes



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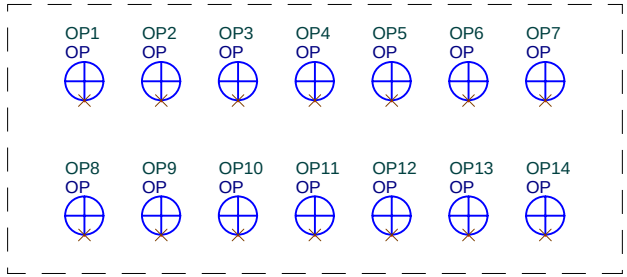

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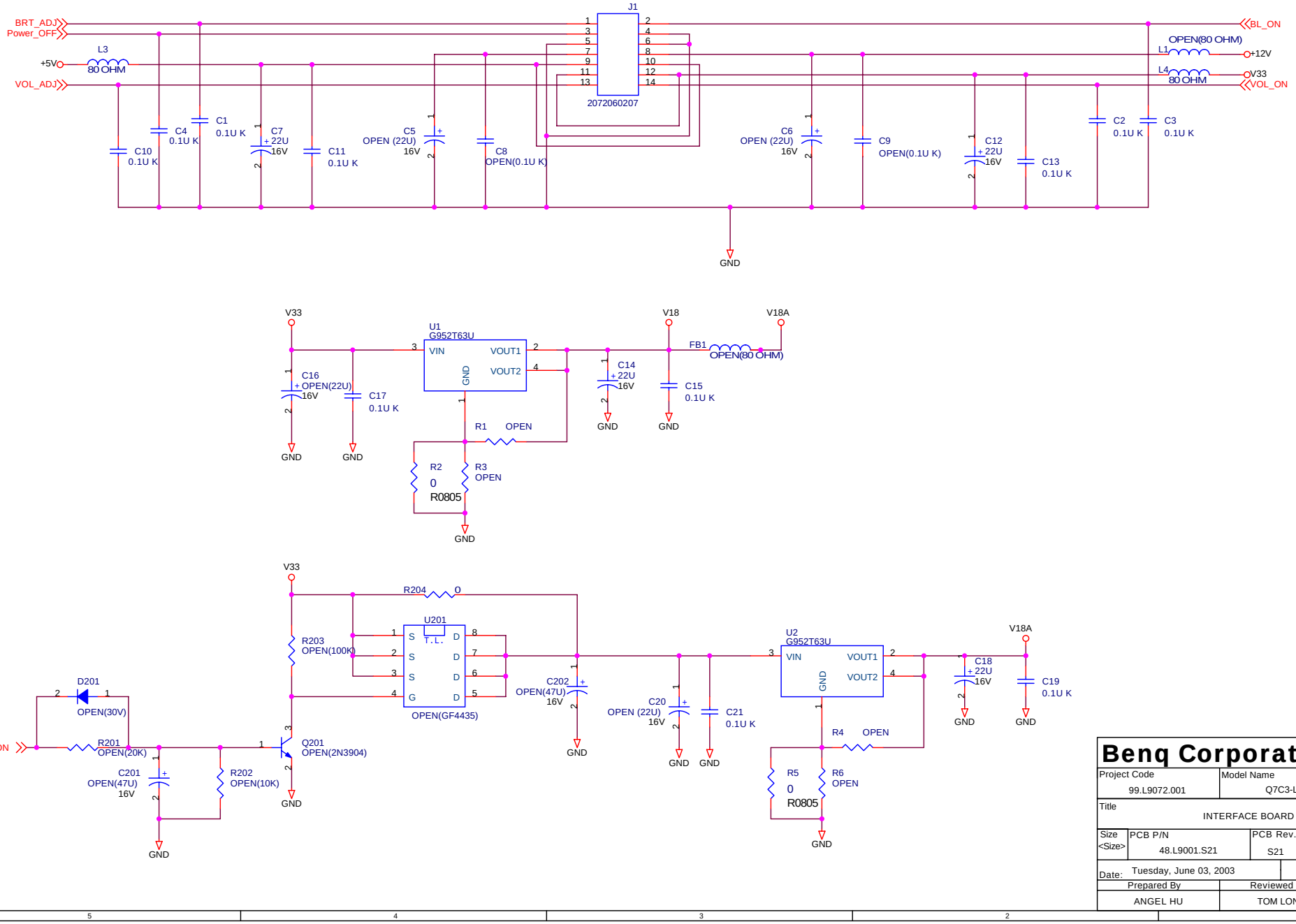

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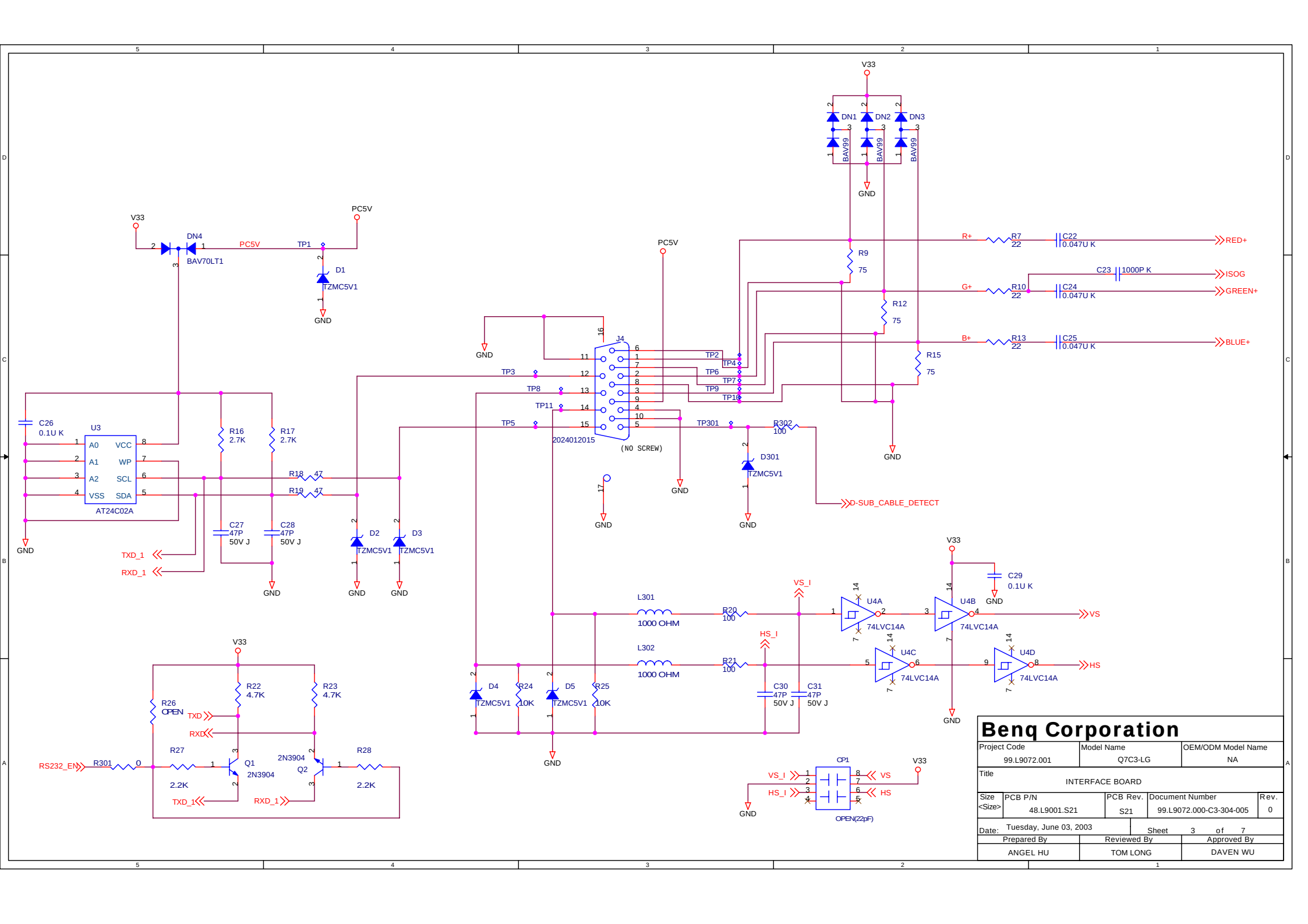

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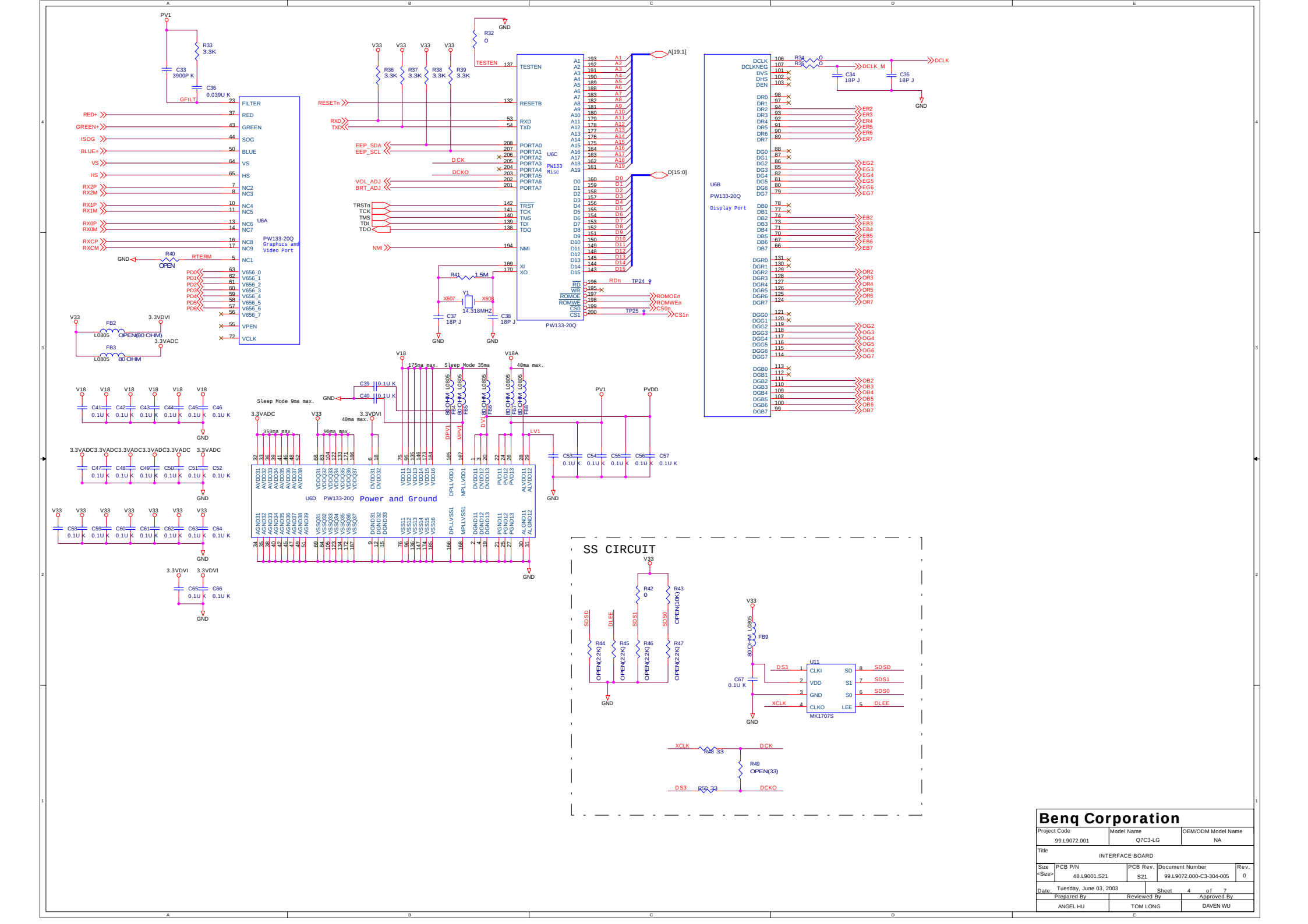

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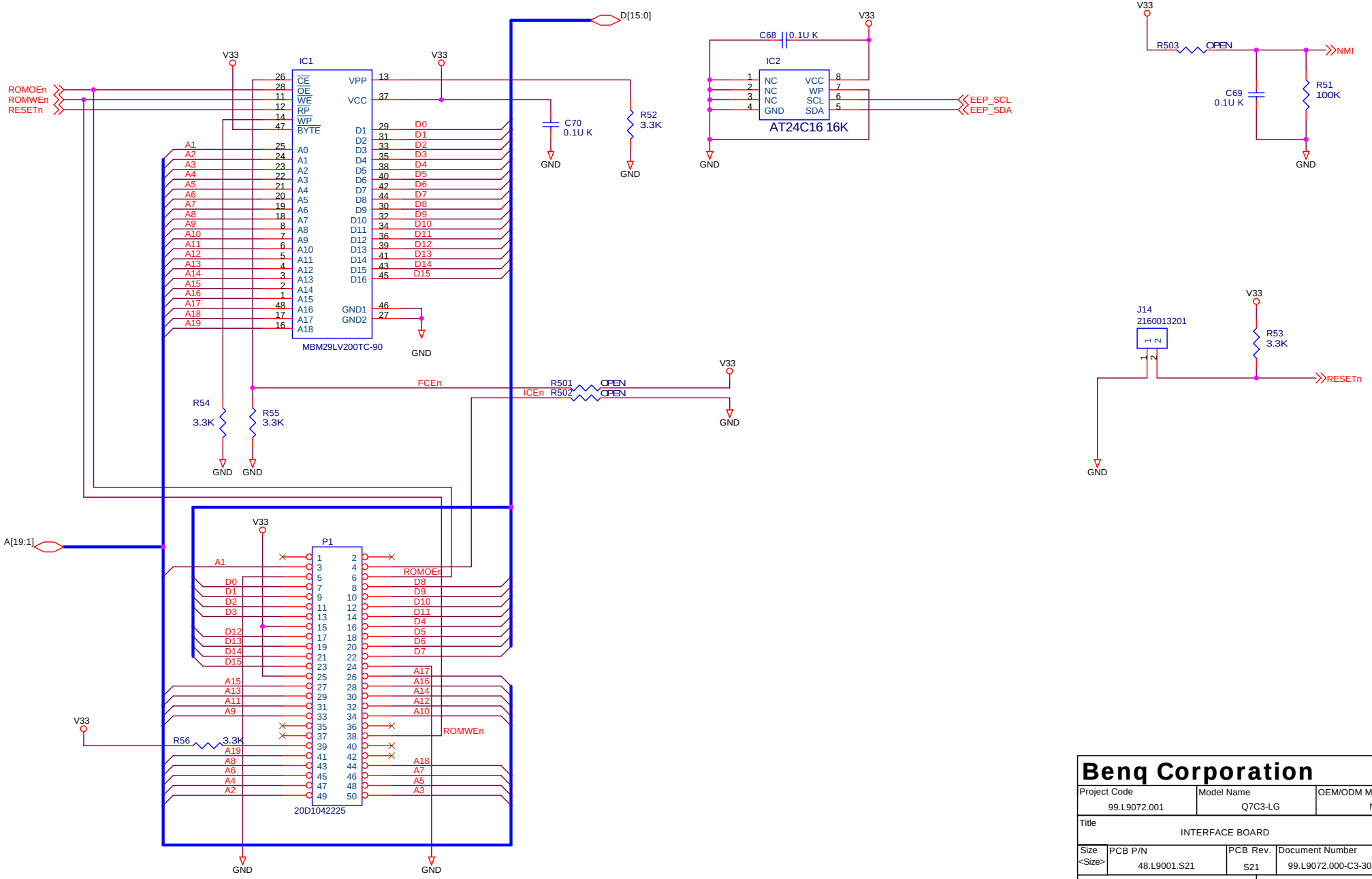

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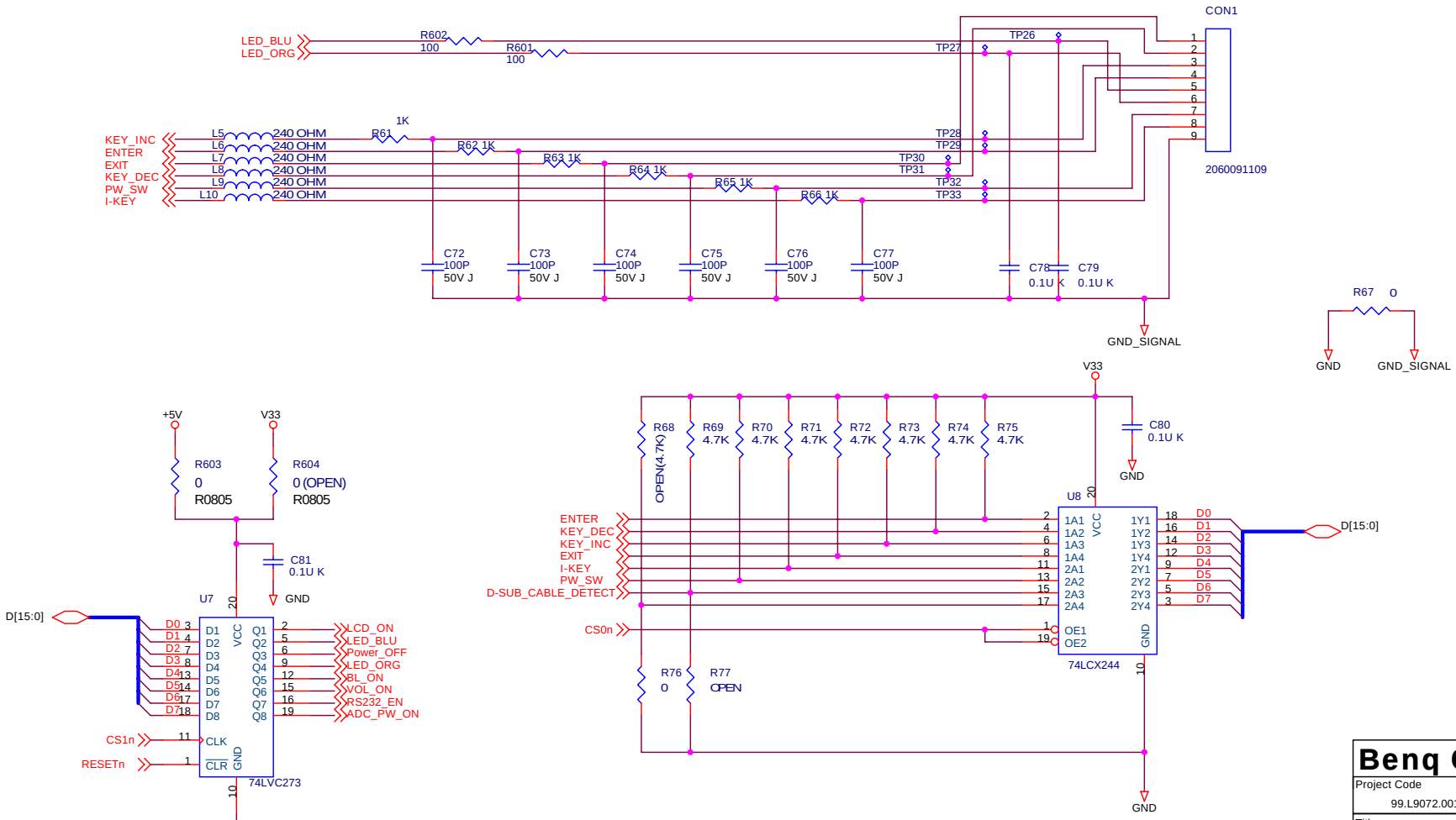

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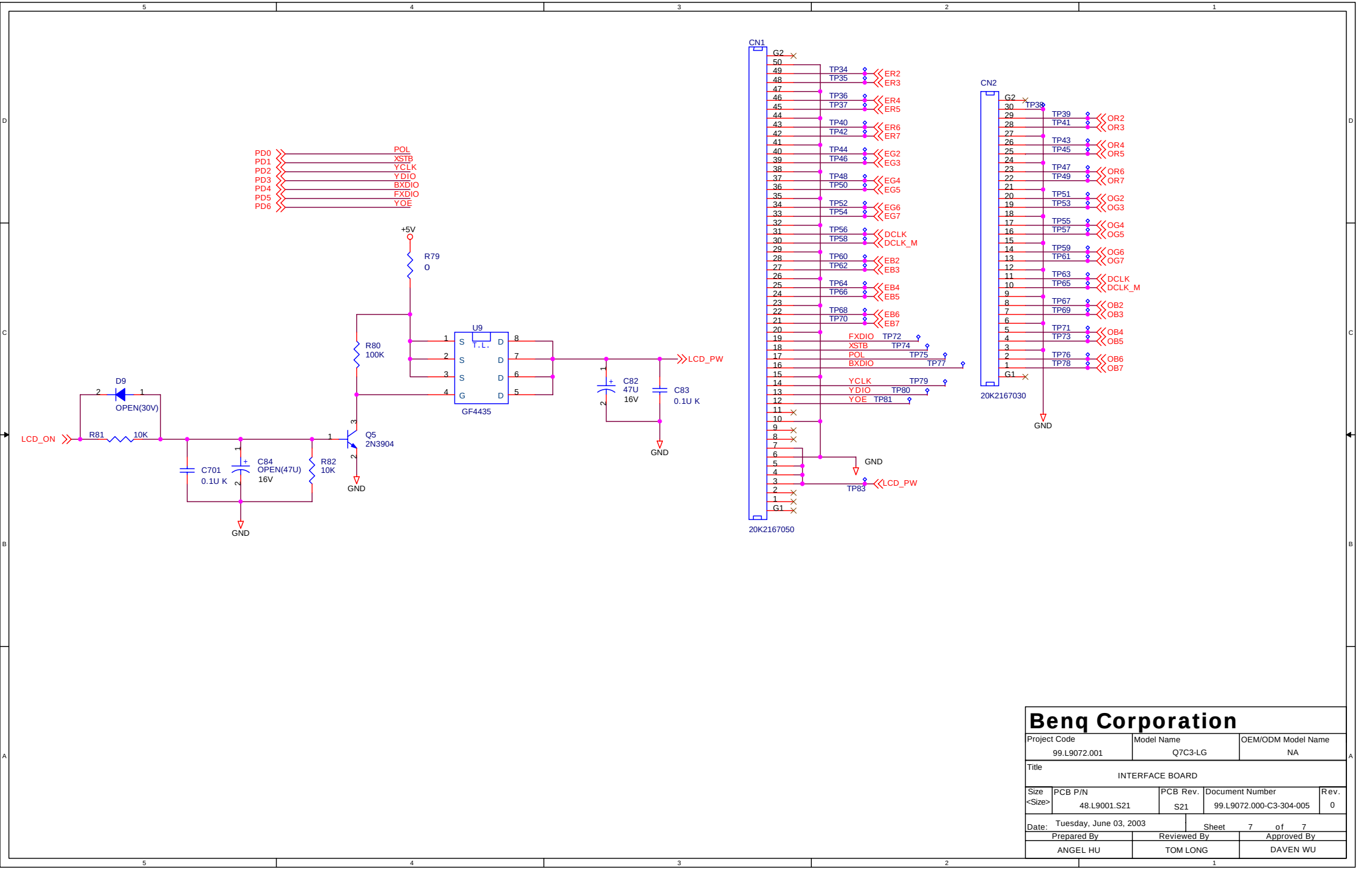
ANGEL HU	TOM LONG	DAVEN WU



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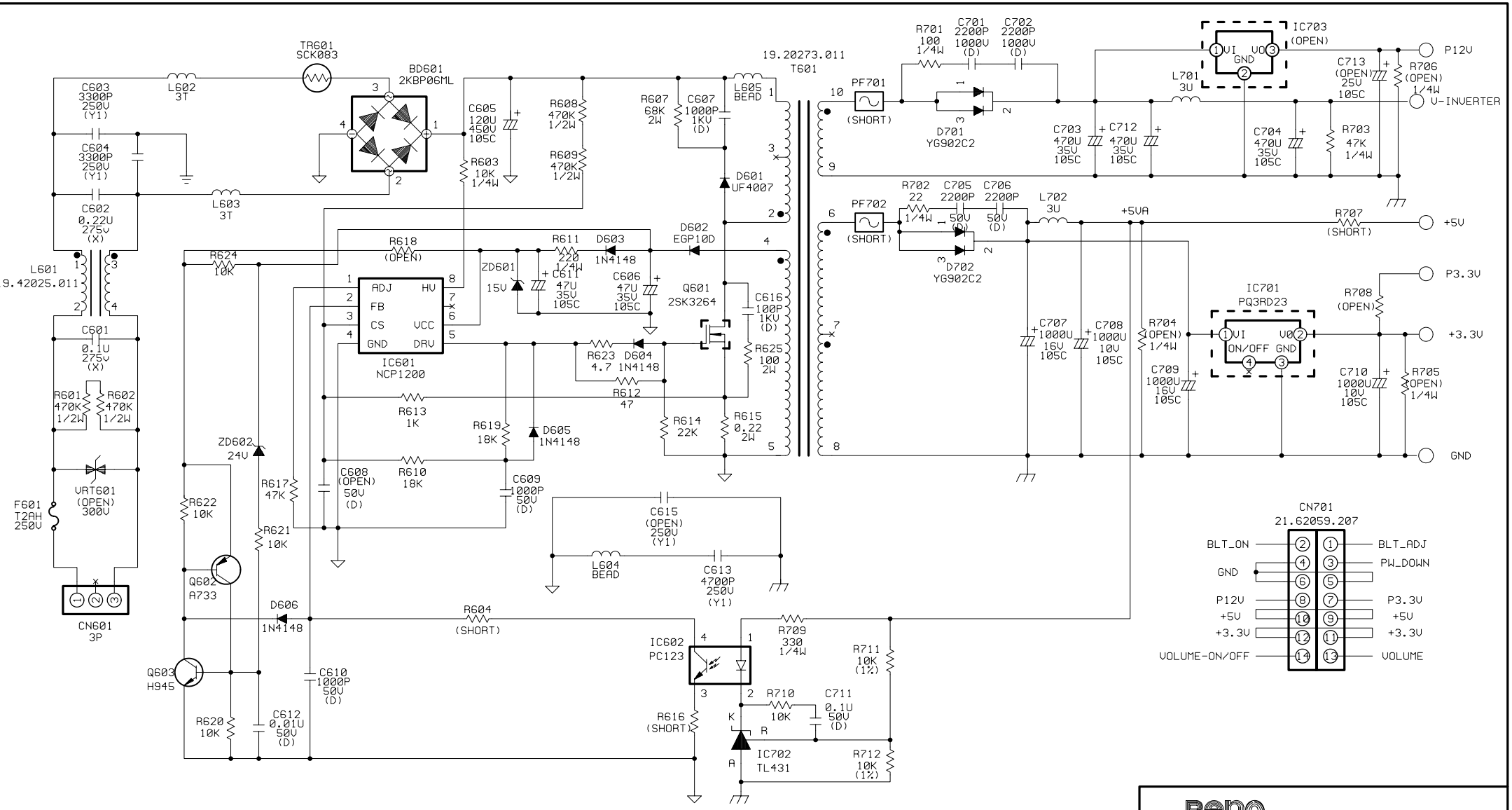

NOTES:
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Doc.No. 99.L9072.000-C3-304-004			
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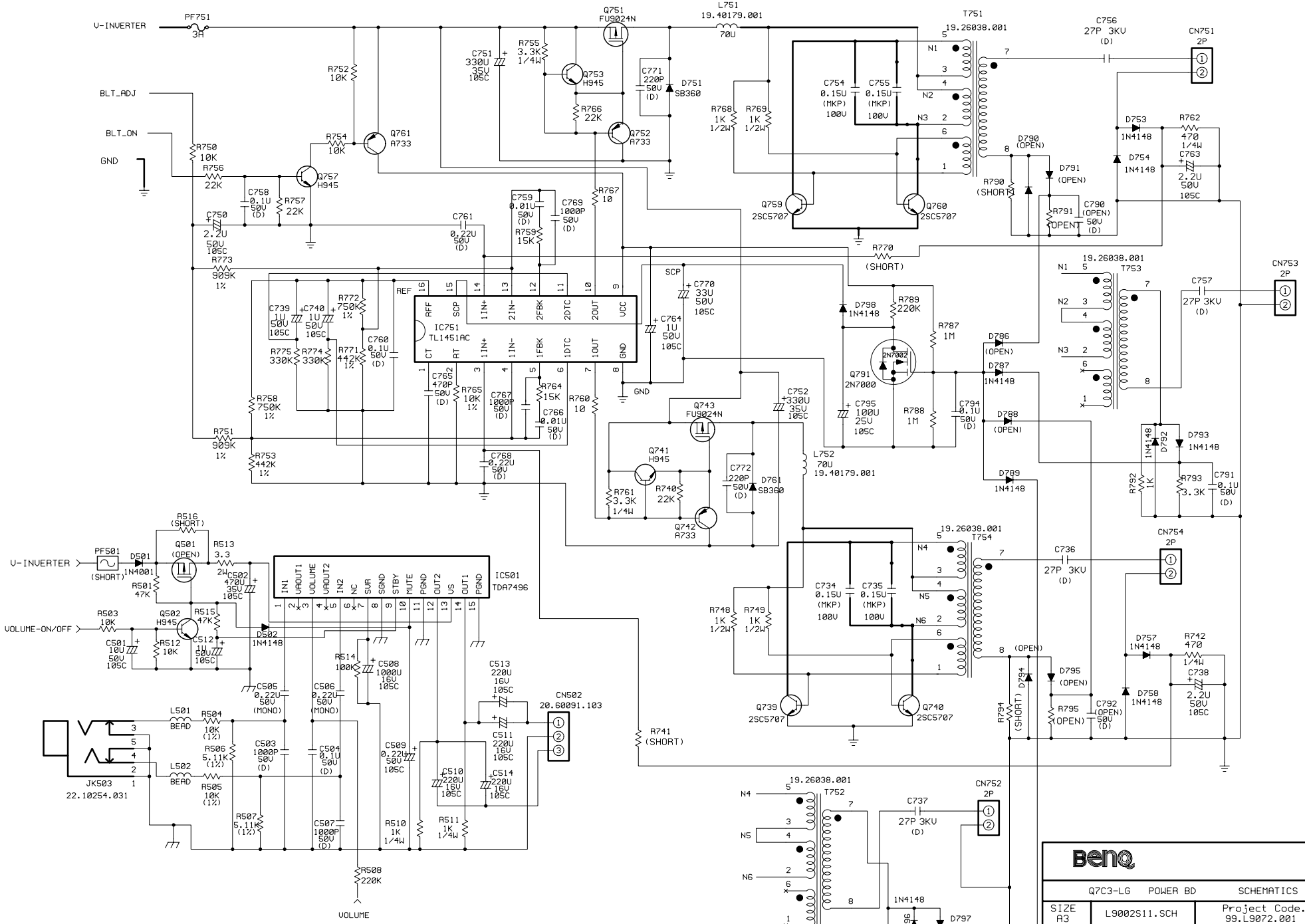
ANGEL HU 6/3/2003	GEORGE SHEU 6/3/2003	H.J. WONG 6/3/2003	



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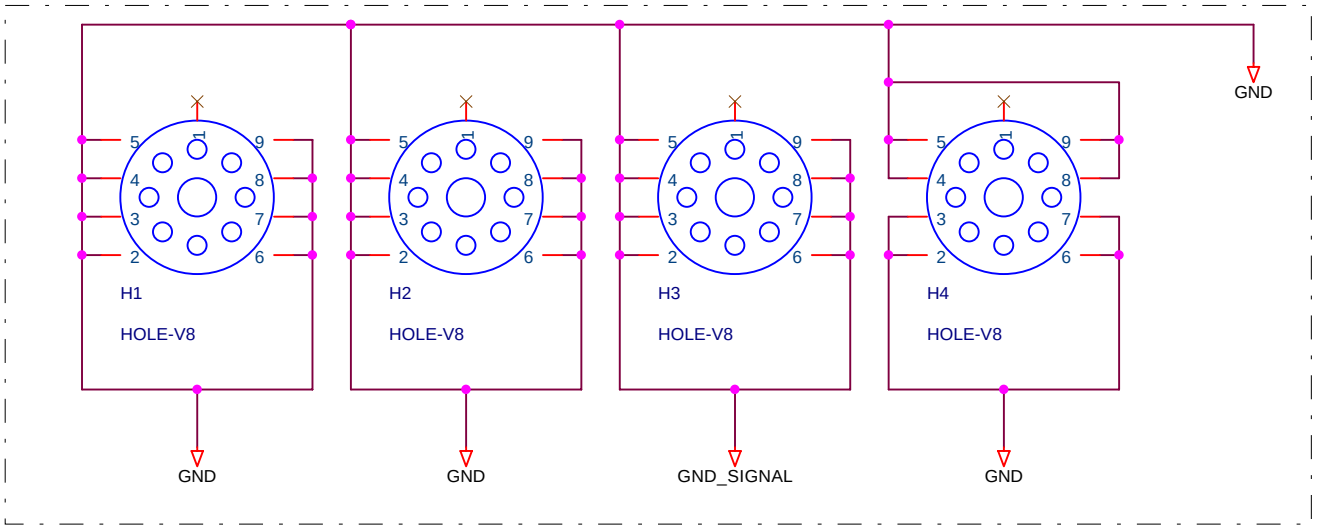
Screw Holes



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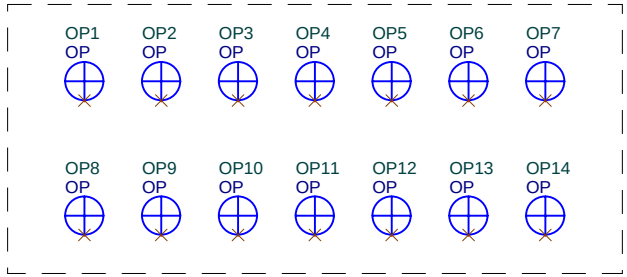

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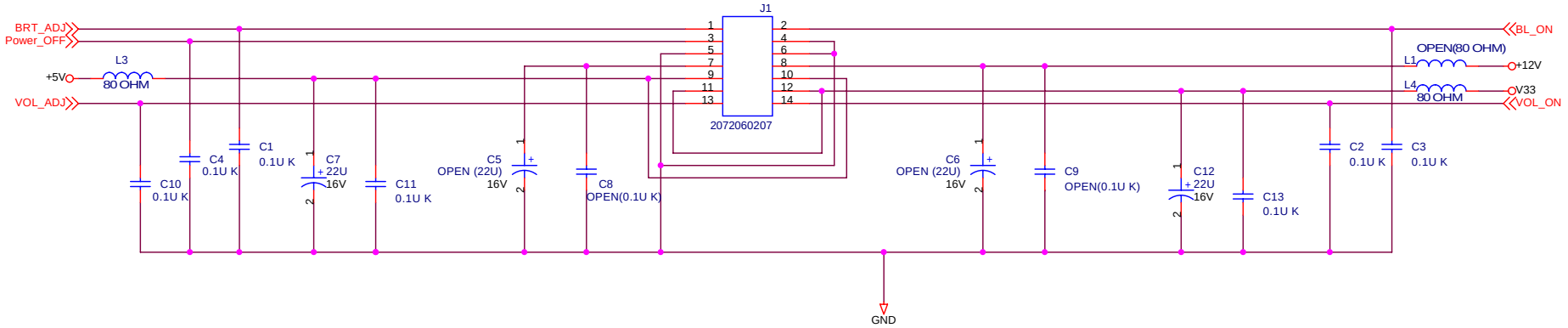
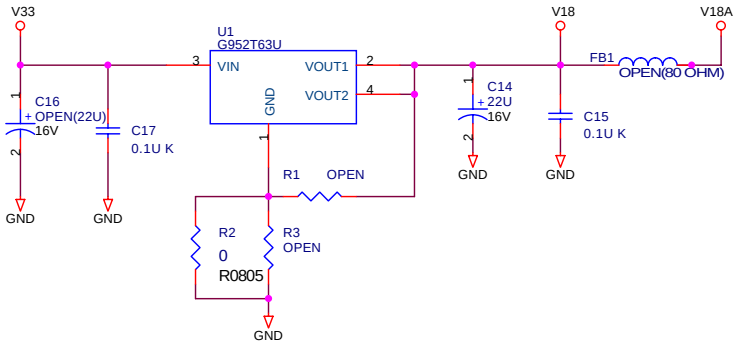
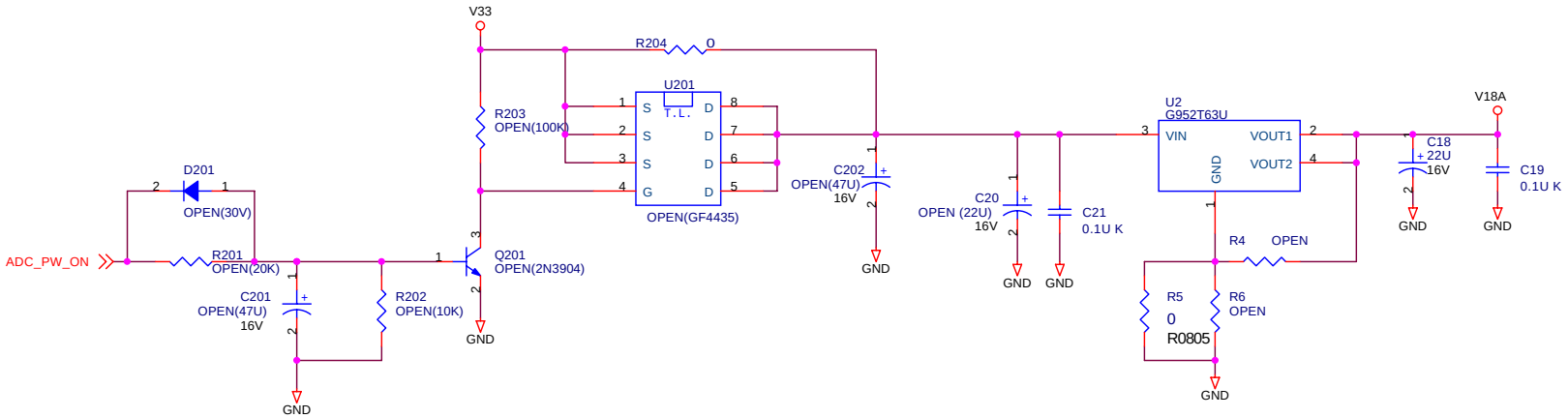
ANGEL HU	WAIT CHEN	DAVEN WU







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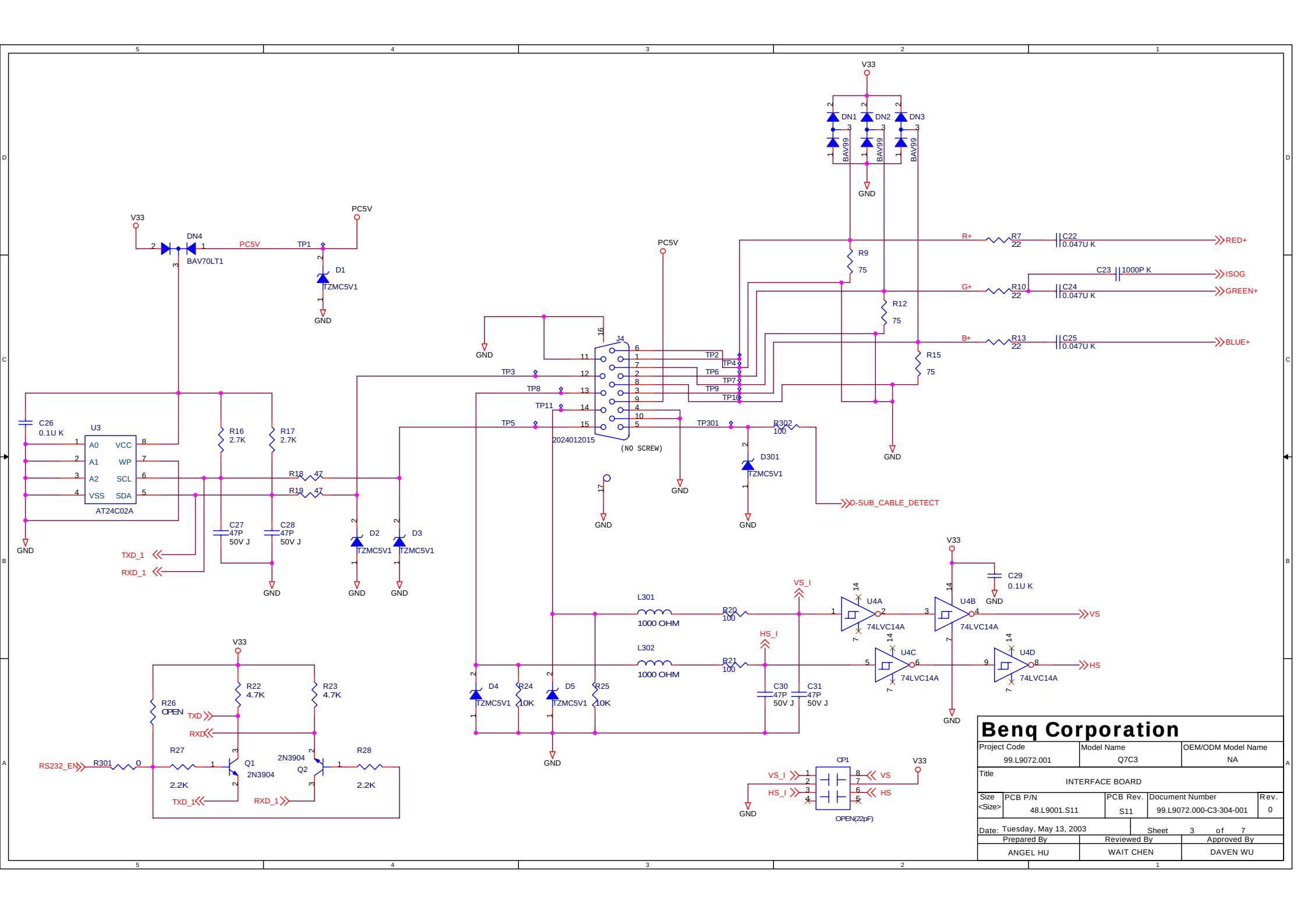

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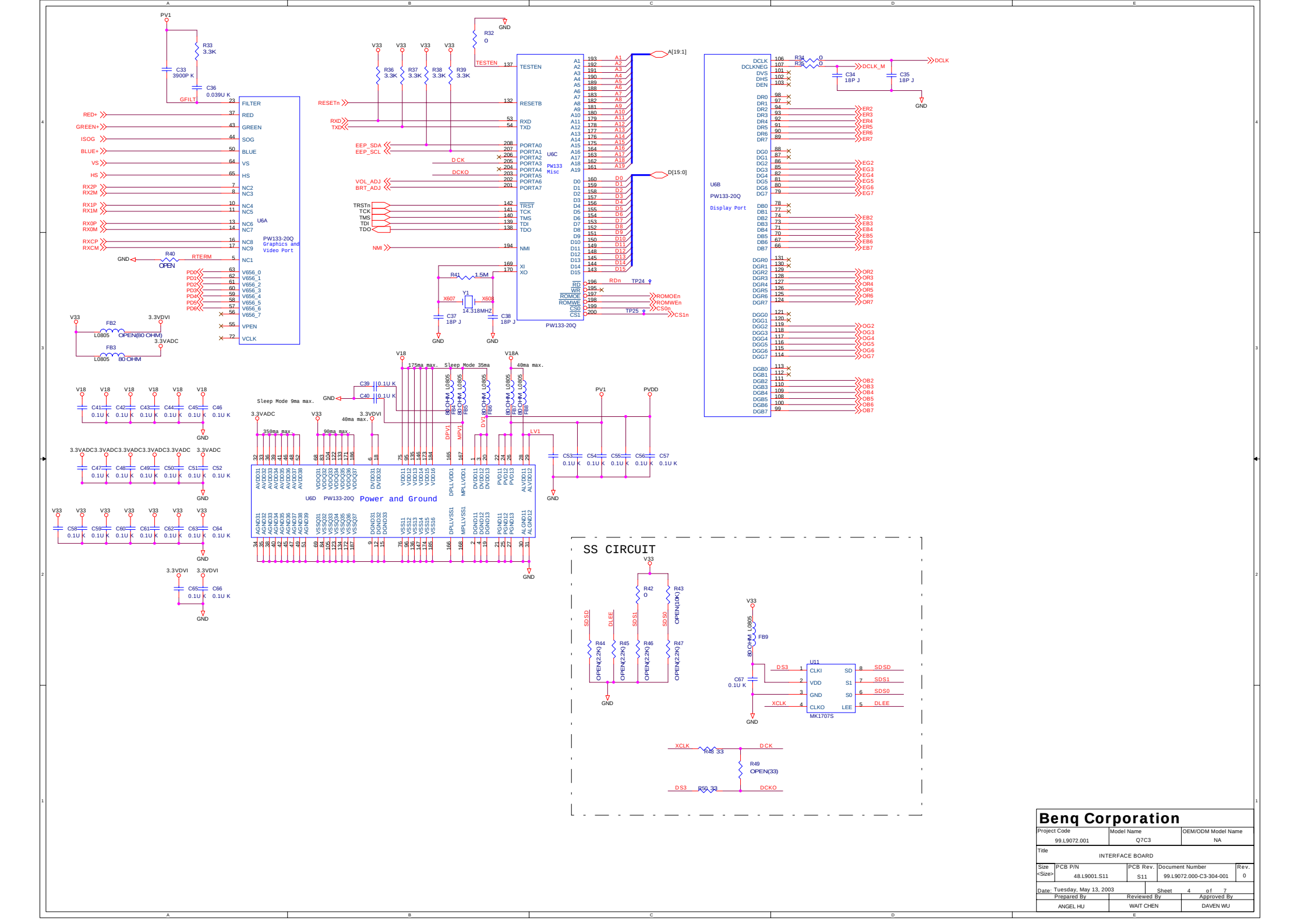
ANGEL HU	WAIT CHEN	DAVEN WU



Benq Corporation

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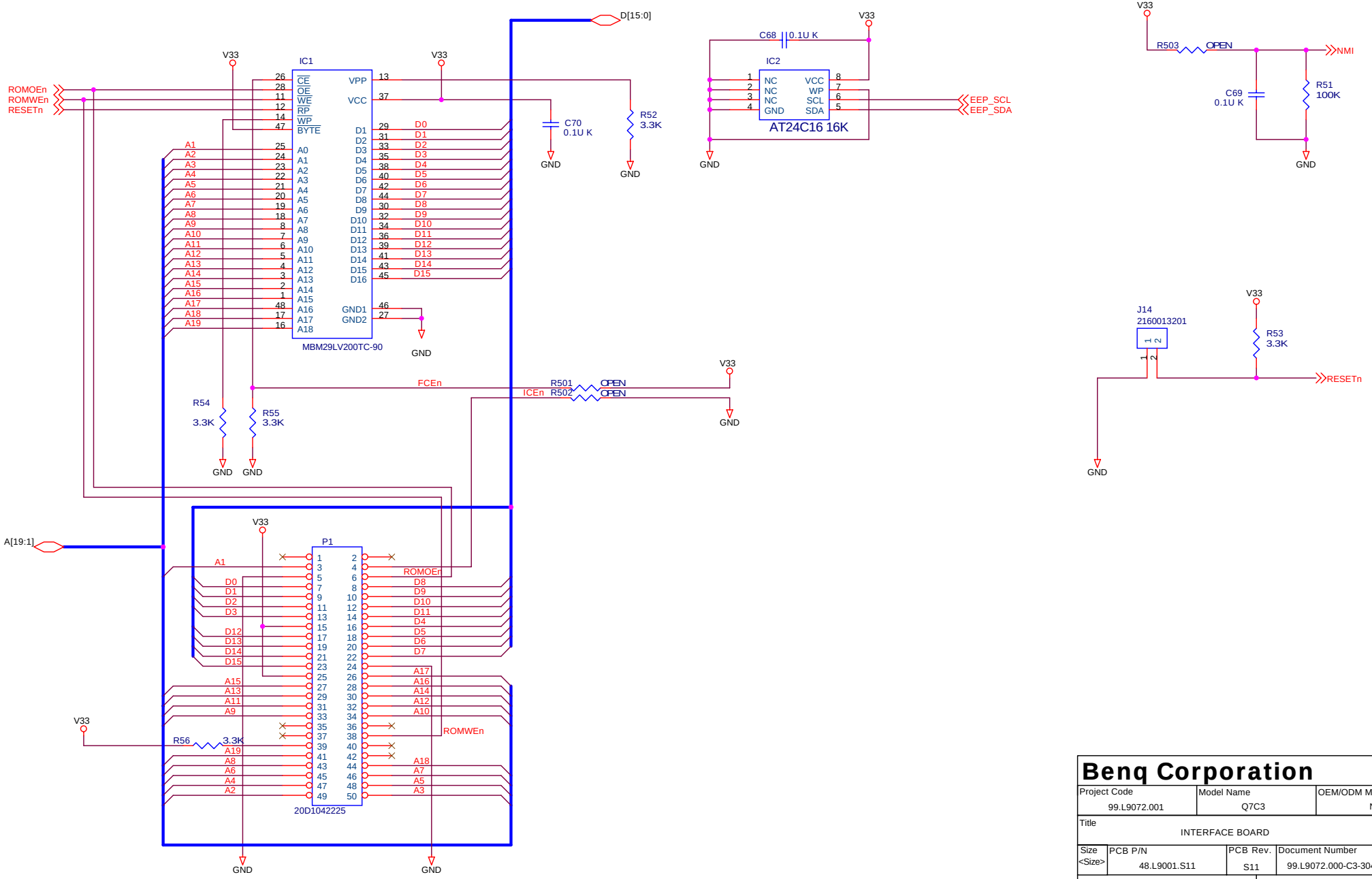

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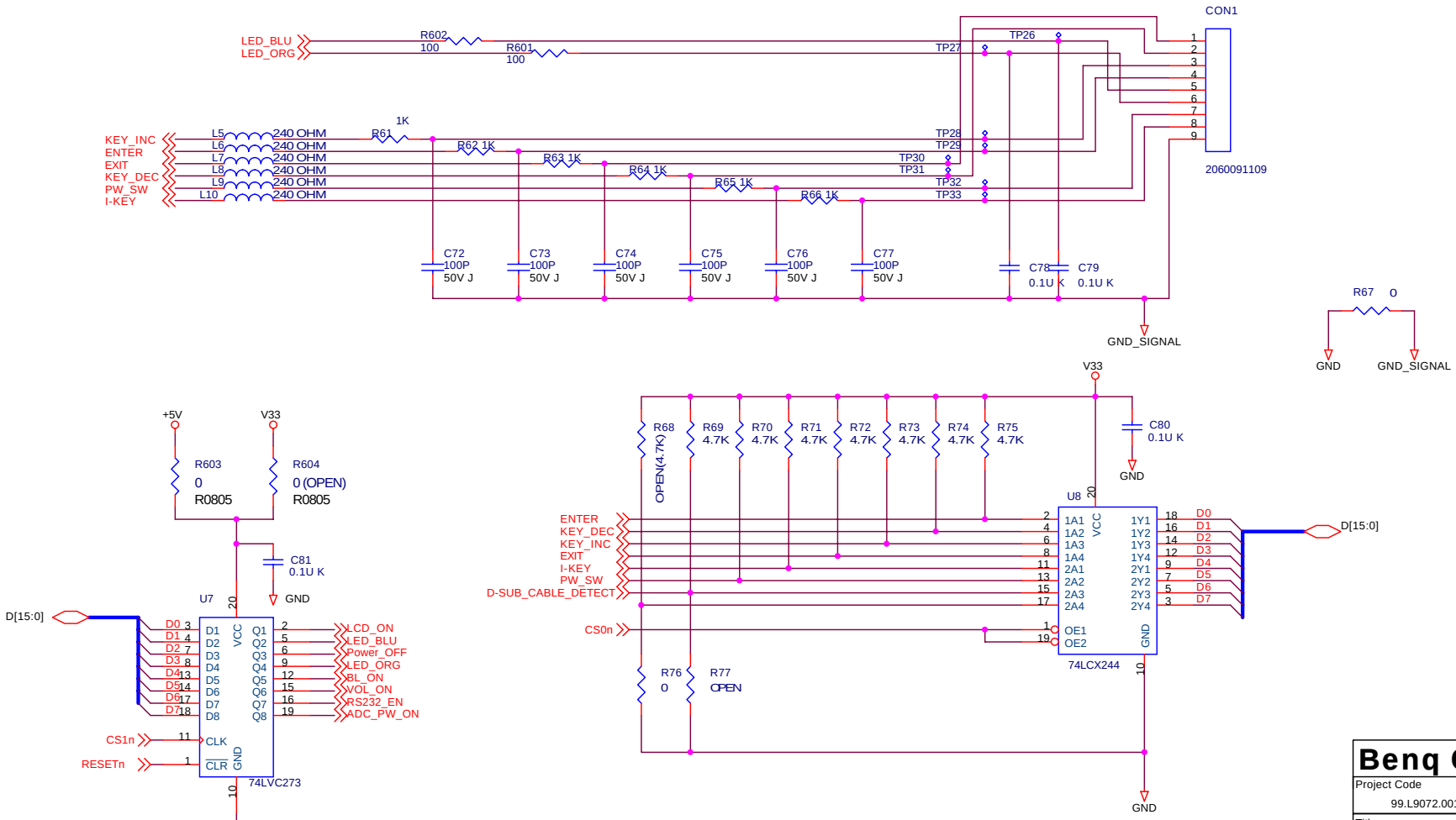

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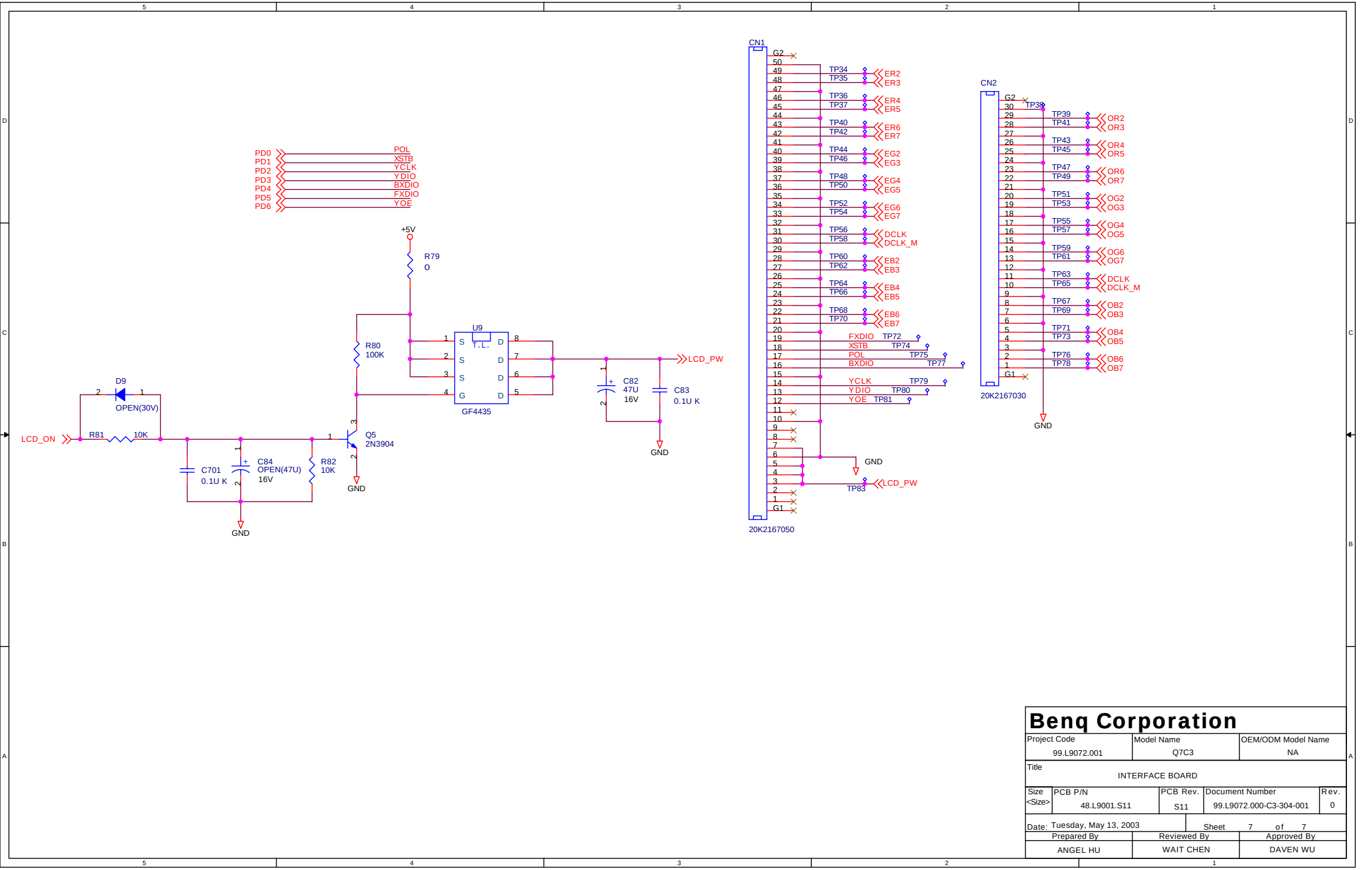
Prepared By	Reviewed By	Approved By
ANGEL HU	WAIT CHEN	DAVEN WU



Benq Corporation

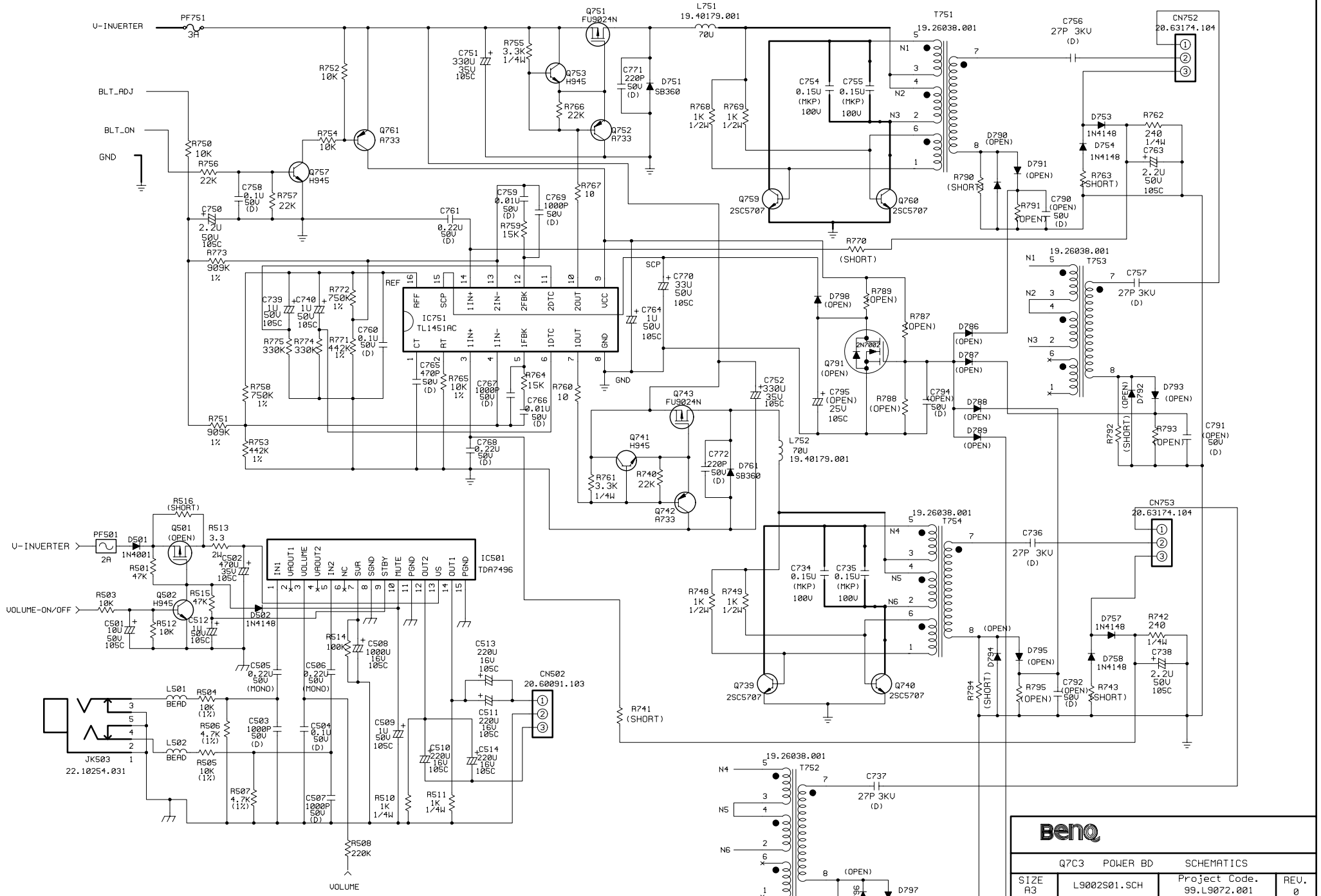
Project Code	Model Name	OEM/ODM Model Name
99.L9072.001	Q7C3	NA

Title: INTERFACE BOARD

Size	PCB P/N	PCB Rev.	Document Number	Rev.
<Size>	48.L9001.S11	S11	99.L9072.000-C3-304-001	0

Date: Tuesday, May 13, 2003 Sheet 7 of 7

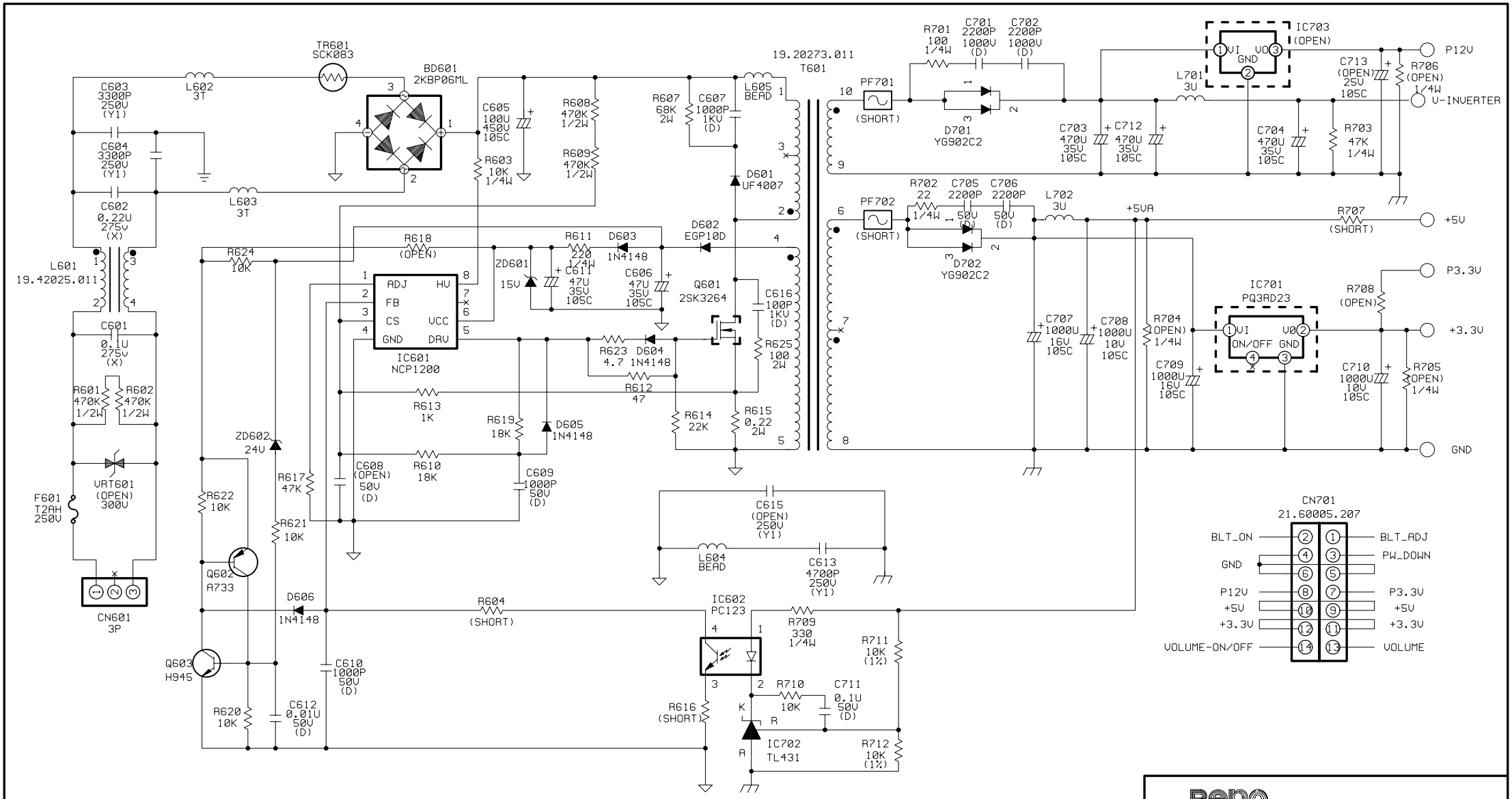
Prepared By	Reviewed By	Approved By
ANGEL HU	WAIT CHEN	DAVEN WU



NOTES: 1. Resistor values are in ohm, K=1,000 ohm, M=1,000,000 ohm
2. All resistors are 1/8 watt, 5% except where otherwise indicated
3. Represents PCB common ground.

BenQ

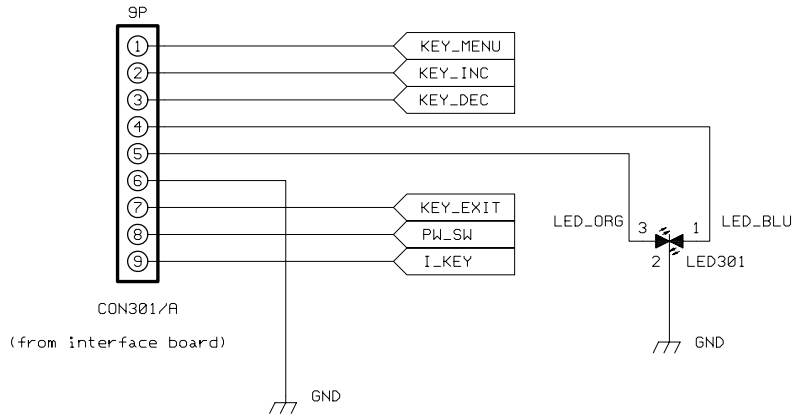
Q7C3 POWER BD SCHEMATICS			
SIZE A3	L9002S01.SCH	Project Code. 99.L9072.001	REV. 0
DATE : 5/20/2003		Sheet 1 OF 2	
Doc.No. 99.L9072.000-C3-304-002			
Prepared By	Reviewed By	Approved By	
ANGEL HU 5/20/2003	GEORGE SHEU 5/20/2003	H.J. WONG 5/20/2003	

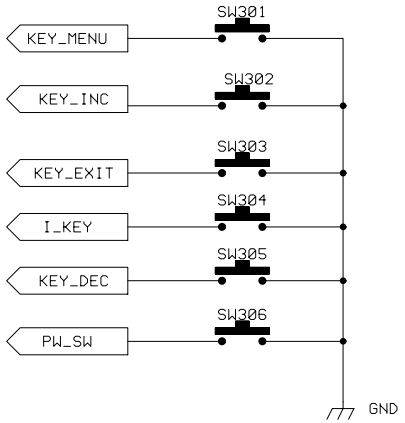


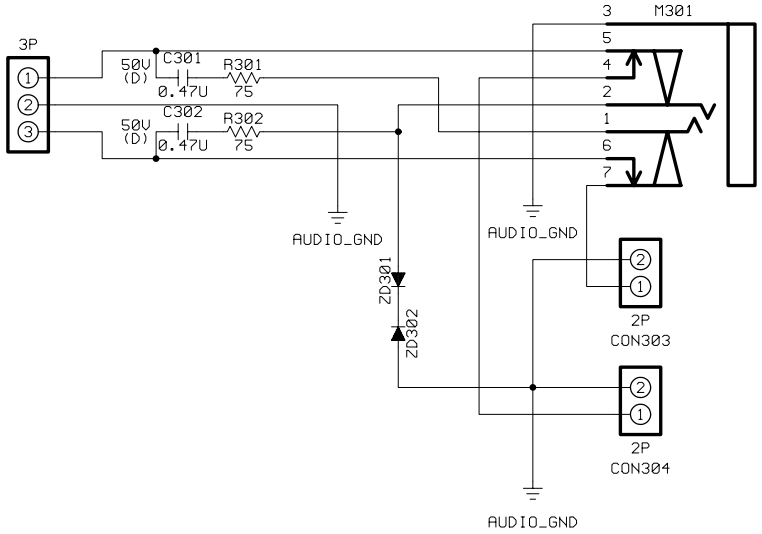
NOTES: 1. Resistor values are in ohm, K=1,000 ohm, M=1,000,000 ohm
2. All resistors are 1/8 watt, 5% except where otherwise indicated
3. ⏚ ⏚ ⏚ Represents PCB common ground.

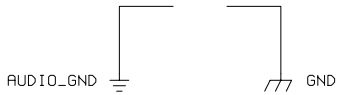
BenQ

Q7C3 POWER BD SCHEMATICS			
SIZE A4	L9002S01.SCH	Project Code. 99.L9072.001	REV. 0
DATE : 5/20/2003		Sheet 2 OF 2	
Doc.No. 99.L9072.000-C3-304-002			
Prepared By	Reviewed By	Approved By	
ANGEL HU 5/20/2003	GEORGE SHEU 5/20/2003	H.J. WONG 5/20/2003	









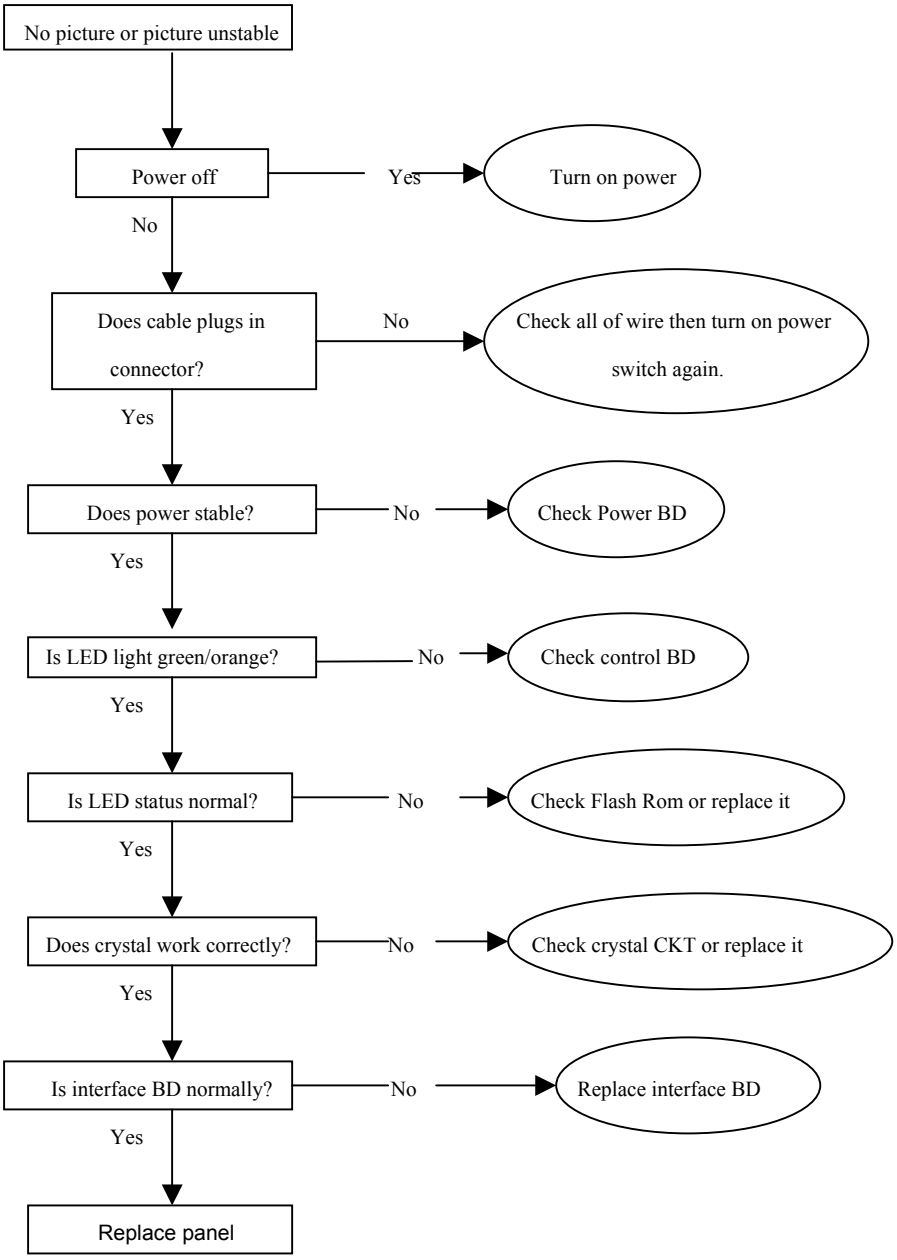
NOTES:
1. Resistor values are in ohm, K=1,000 ohm, M=1,000,000 ohm
2. All resistors are 1/8 watt, 5% except where otherwise indicated
3. ⏚ ⏚ ⏚ Represents PCB common ground.

BenQ			
Q7C3 CTRL BD SCHEMATICS			
SIZE A4	L9003S03.SCH	Project Code. 99.L9072.001	REV. 1
DATE : 6/13/2003		Sheet 1 OF 1	
Doc.No. 99.L9072.000-C3-304-003			
Prepared By	Reviewed By	Approved By	
ANGEL HU 6/13/2003	WAIT CHEN 6/13/2003	DAVEN WU 6/13/2003	

Q7C3 TROUBLE SHOOTING GUIDE

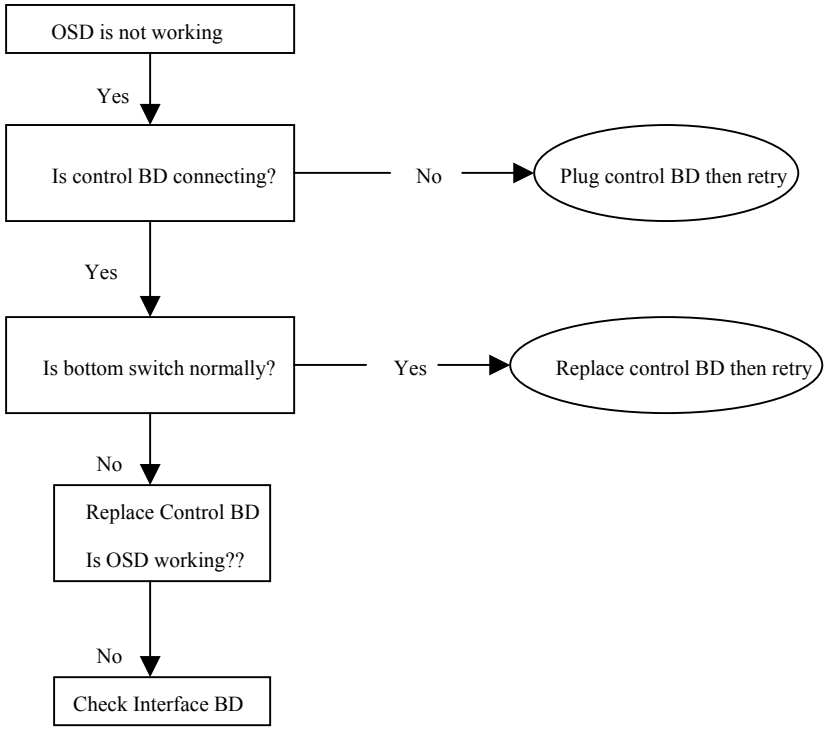
No Display or display is unstable:

1.1 Interface Board:

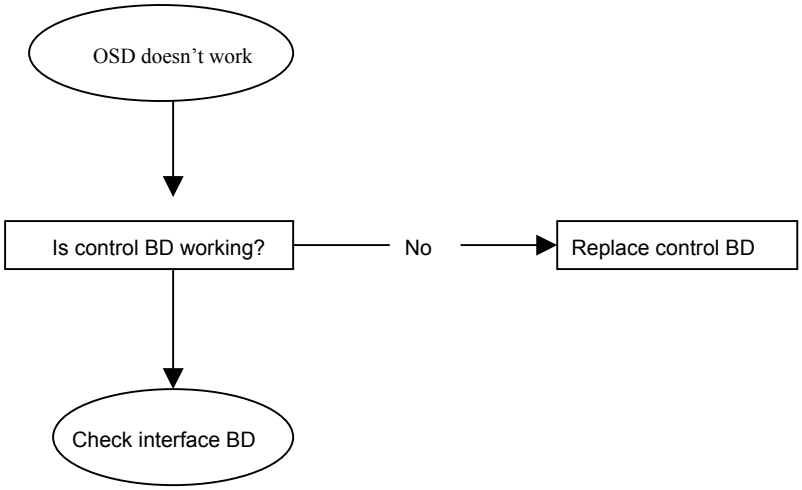


2. BUTTON function:

2.1 Control Board



3. OSD function:



4. Power Board